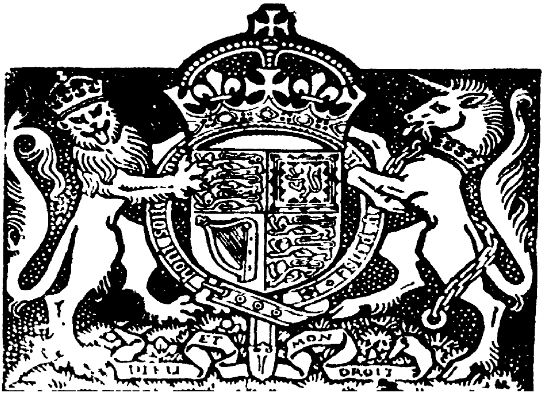

IMPERIAL AGRICULTURAL
RESEARCH INSTITUTE, NEW DELHI.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

SIR A. SMITH WOODWARD, LL.D., F.R.S., F.G.S.,
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AND
W. T. CALMAN, D.Sc., F.R.S.

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"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini, ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

"..................... per litora spargite muscum,
Naiades, et circùm vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo.
N. Parthenii Giannettasii, Ecl. 1.

No. 67. JULY 1933.

I.—*New Tertiary Crabs in the Collection of the British Museum.* By MARTIN F. GLAESSNER, Phil. Dr., J.U.Dr.

[Plates I.–VI.]

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INTRODUCTION.

The present communication represents the first results of an investigation, commenced in the autumn of 1930, of the foreign Decapod Crustacea in the collection of the British Museum. I have much pleasure in expressing my sincerest gratitude to the Keeper of the Department of Geology, Dr. W. D. Lang, for allowing me facilities for working in the British Museum, and to his Assistant-Keeper, Mr. T. H. Withers, for much kind and useful advice and friendly criticism. My thanks are also due to Mr. Withers for several alterations in my manuscript which added to the correctness of the text and figures.

MIOCENE BRACHYURA FROM MALTA.

Tertiary crabs from Malta have been already mentioned by H. Woodward in 1873, but only three of the six genera and none of the species were correctly determined.

Ranina (*Ranina*) cf. *brevispina* Lörenthey.

1873. *Ranina adamsi*, nom. nud., H. Woodward, Rep. 42nd Meeting Brit. Assoc. Adv. Sci. (Brighton, 1872), p. 325.
1898. *Ranina brevispina* E. Lörenthey, Termész. Füzetek, xxi. p. 135, pl. x. figs. 2, 3, pl. xi. fig. 1.

Material.—A cephalothorax with the frontal part broken away; the sternum is well shown. The specimen comes from the *Globigerina* Limestone (In. 28053).

Remarks.—This specimen has the same outline as *R. brevispina* Lörenthey from the Miocene of Algeria. The sculpture of the carapace is not very well preserved, but apparently not essentially different. The specific identification must remain doubtful, since the front of the Maltese specimen is broken off and the sternum of the Algerian one has not yet been cleaned.

Calappa heberti Brocchi.

1883. *Calappa heberti* P. Brocchi, Ann. Sci. Géol. xiv. p. 2, pl. iv. fig. 3.
1898. *Calappa heberti* E. Lörenthey, Termész. Fuzetek, xxi. p. 88, pl. viii. figs. 1–3, pl. ix. fig. 1.
1928. *Calappa heberti* M. Glaessner, Jahrb. Geol. Bundesanst. Wien, lxxviii. p. 174.
1929. *Calappa heberti* M. Glaessner, N. Jahrb. f. Min., Beilageband, lxiii. Abt. B, p. 168.
1929. *Calappa heberti* E. Lörenthey and K. Beurlen, Geol. Hungar. Ser. Pal. fasc. 3, p. 130, pl. vi. figs. 2, 9–12.

Distribution.—Burdigalian, Malta and Vienna Basin; Helvetian, Vienna Basin; Tortonian, Hungary and Vienna Basin. Probably Miocene of France and Italy.

Material.—A right movable finger with a fragment of the propodus, showing the joint. *Globigerina* Limestone (In. 28054). A fragment of a right movable finger, labelled "*Globigerina* Limestone, Div. D. Uied Sakkaja," In. 22632.

Maja ? sp.

1873. *Maja* sp. H. Woodward, Rep. 42nd Meeting Brit. Assoc. Adv. Sci. (Brighton, 1872), p. 325.

Material.—Three meropodites of chelipeds showing strong spines on the surface. Distal part of chela and fragment of immovable finger. Locality unknown (In. 28055–57, In. 28059, In. 22638). Distal part of a chela. Upper Coralline Limestone, Ras-el-Kammieh (In. 28990).

Cancer sp.

Material.—One right and one left chela. The right one is complete, with both fingers and distal part of carpus preserved. The left one with fragment of dactylus. Upper Coralline Limestone, Ras-el-Kammieh (In. 28987–88).

Description.—Propodus triangular in outline, greatest height twice the height at the carpal joint. Inner surface flat; outer surface regularly vaulted, with five longitudinal rows of small granules. Inferior margin rounded; upper edge with five prominent spines. Three spines just below the edge on the outer surface, one on the upper articular process of the carpal joint. Immovable finger with four teeth. Dactylus without prominent teeth; its upper edge bears a row of granules on the proximal half. Carpus with several spines and a granulated external ridge. The whole surface of the shell is covered with an extremely fine granulation.

These chelæ do not belong to *Cancer sismondai* v. Meyer. They differ from the chelæ of that species chiefly in their triangular outline and in the arrangement of the spines.

Necronectes schafferi Glaessner.
(Pl. I. fig. 1.)

1873. *Scylla serrata* H. Woodward, Rep. 42nd Meeting Brit. Assoc. Adv. Sci. (Brighton, 1872), p. 325.

1928. *Necronectes schafferi*, M. Glaessner, Jahrb. Geol. Bundesanst. Wien, lxxviii. p. 179, pl. iii. fig. 6, text-fig. 4.

Distribution.—Burdigalian and probably Helvetian, Malta and Vienna Basin. Tortonian, Vienna Basin.

Material.—A male and a female specimen, showing the nearly complete cephalothorax and parts of the abdomen and chelæ. *Globigerina* Limestone; locality unknown (In. 28049, In. 28051). A young female with the cephalothorax, abdomen, and fragments of all the legs preserved. Green Sandstone, probably Helvetian. Locality unknown (In. 28050). Several isolated fingers. *Globigerina* Limestone, Div. D, Uied Sakkaja (In. 22629–31).

Remarks.—This species was founded on a single carapace from the Miocene (Tortonian, "Leithakalk") of the Vienna Basin. The identification of the Maltese crabs with the Austrian species is not at all in doubt, although the type is much smaller. A well-preserved specimen showing the left half of the cephalothorax, the complete right cheliped (slender chela), the strong left dactylus, and several pereiopods, including the left swimming-leg, was recently found in the Burdigalian Sandstone at Reinprechtspölla, District of Horn, near Vienna. We may add to the description of the species that the front shows two pairs of conical spines. The inner ones are situated nearer to each other. There are two supra-orbital fissures with a projecting lobe in between. The urogastric region is wider than in *N. proavitus* Rathbun. The chelæ are smooth.

Several other species are to be included in the genus *Necronectes*, of which *N. vidalianus* A. M.-Edw., from the French Middle Oligocene, is the type. It is not very probable that *N.* ? *bockhi* (Lörenthey), from the Eocene of Hungary, belongs to this genus, but it is probably its ancestor. In 1928 it was shown by me that "*Gatunia*" *proavita* Rathbun, from the Miocene of Panama, is a *Necronectes*. Rathbun supposed "*Scylla*" *michelini* A. M.-Edw. to be a "*Gatunia*." Now, since the chelæ of *N. schafferi* have been found, there is no more doubt as to the correctness of this identification. "*Cancer*" *beaumonti* A. M.-Edw. belongs to *Necronectes* (see Glaessner, 1929 *b*, p. 264), and it is possible that the specimen came from Malta. If the figure is correct it differs from *N. schafferi* in the shape of the teeth and in the absence of the ridge on the last (lateral) spine. Most probably "*Scylla molassica* Studer" (non *Cancerites molassicus* Quenstedt!) should also be included in *Necronectes*. At the present time it is impossible to compare this species with *N. schafferi*, since it is known by the sternum only. In 1929 Lörenthey and Beurlen described and figured a propodus and dactylus of a Portunid as "*Scylla* sp. (cf. *michelini* A. M.-Edw.)." These fragments, too, belong to *Necronectes*, and may be called more adequately *N.* cf. *schafferi.*

It becomes clear now that *Necronectes* is one of the characteristic elements of the Miocene crab fauna. It is easily recognized by the eight antero-lateral teeth and by its smooth chelæ Consequently I give a list of all species belonging certainly or probably to this genus. I agree now with Beurlen in the opinion that *Necronectes* is a Portunid, although in 1928 I followed Miss Rathbun in creating a new family for this interesting genus :—

N. schafferi Glaessner. Miocene. Austria, Malta.
N. cf. *schafferi* Glaessner. Miocene. Hungary.
N. michelini (A. M.-Edw.). Miocene. France (Touraine).
N. beaumonti (A. M.-Edw). ? ?
N. proavitus (Rathbun). Miocene. Panama.
N. ? *molassicus* (Studer). Miocene. Switzerland.
N. vidalianus A. M.-Edw. Oligocene. France (S.W.).
N. ? *bockhi* (Lörenthey). Eocene. Hungary.

Neptunus granulatus A. M.-Edw.

1860. *Neptunus granulatus* A. Milne-Edwards, Ann. Sci. Nat. Zool. (4) xiv. p. 241, pl. iii. fig. 1, pl. vii. fig. 2.
1860. *Neptunus monspeliensis* A. Milne-Edwards, *ibid.* pl. 232, pl. iv. fig. 1, pl. v. fig. 1.
1873. *Neptunus* ? sp. H. Woodward, Rep. 42nd Meeting Brit. Assoc. Adv. Sci. (Brighton, 1872), p. 325.
1873. *Portunites* sp. H. Woodward, *ibid.* p. 325.
1887. *Achelous delgadoi* (pars) F. Fontannes, Ann. Sci. Géol. xvi. art. 3, pl. vii. figs. 4, 6.
1888. *Neptunus granulatus* G. Ristori, Atti Soc. Tosc. Sci. Nat. ix. p. 215, pl. iv. figs. 5–11.
1898. *Neptunus* cf. *granulatus* E. Lörenthey, Termész. Füzetek, xxi. p. 92, pl. ix. figs. 2, 3.
1901. *Neptunus granulatus* M. Blanckenhorn, Z. deutsch. Geol. Ges. liii. pp. 76, 112.
1909. *Neptunus granulatus* E. Lörenthey, Math.-Naturw. Ber. Urgarn, xxiv. p. 242, pl. ii. figs. 1, 2.
1927. *Neptunus granulatus* V. van Straelen, Eos, Riv. Esp. Entom. iii. p. 86.
1928. *Neptunus granulatus* M. Glaessner, Jahrb. Geol. Bundesanst. Wien, lxxviii. p. 183.
1929. *Neptunus granulatus* E. Lörentheyand K. Beurlen, Geol. Hungar. Ser. Pal. fasc. 3, p. 188, pl. xiii. figs. 3, 4, pl. xiv. figs. 1, 4.

Distribution.—*Neptunus granulatus* has a very wide geographical range in the Miocene Mediterranean Basin.

It is known from Portugal, Spain, Malta, Sardinia, the Rhône Basin, Italy, the Sinai Peninsula, Hungary, and Austria (Burdigalian, Helvetian, and Tortonian).

Material.—Eight specimens, showing the body and chelæ in different stages of preservation; two isolated chelæ, and several fragments of fingers (In. 28038–48, 59321, In. 22633–35). The better-preserved specimens come from typical *Globigerina* Limestone of unknown localities; two fragments are from "*Globigerina* Limestone, Div. D, Uied Sakkaja."

Eriphia sp.

Material.—One right propodus, with the immovable finger and the proximal part of the dactylus preserved. Upper Coralline Limestone, Ras-el-Kammieh (In. 28989).

Description.—Outer surface of the propodus covered with very long spines situated in seven not quite regular longitudinal rows. Dactylus with several rows of spines on its upper edge and a strong basal tooth. Immovable finger with a basal granule and four teeth on its upper surface, diminishing in size to the finger-tip.

Eriphia ? sp. (Pl. I. fig. 2.)

1908. *Cancer sismondæ* ? O. Couffon, Feuille jeunes Nat. xxxix. p. 5, pl. ii. figs. 3, 4.

Distribution.—A chela belonging to the same species as two Maltese specimens, was found in the Falun of Doué, Touraine, France, and figured by Couffon (Middle Miocene, Helvetian).

Material.—Two isolated chelæ—a left one with the fingers preserved and a larger right one without fingers. Grey marly limestone, probably Vindobonian. Locality unknown (7049, In. 28052).

Description.—Couffon described the left (smaller) chela only. One of the upper rows of spines on this chela is situated on the inner surface. Two spines are seen on the upper articular process of the carpal joint. The isolated tubercles, which are found in five rows on the outer surface, are inconspicuous except two in each row situated near the carpal margin. The teeth on the fingers are rather prominent and unusually flat and wide, so that there is no cutting-edge. The spines on the right chela are reduced in size and the tubercles are almost invisible; their situation is indicated by four ridges which are very little raised above the contour of the surface.

The chelæ differ from *Cancer* in the blunt yet spiny upper edge of the propodus, in the rows of granules, which are closely set in *Cancer*, and in the shape of the teeth on the fingers. They are more similar to the chelæ of Xanthids, especially to those of *Eriphia*.

Xanthidæ, gen. et sp. indet.

Material.—The presence of a small Xanthid in the Maltese fauna is indicated by an indeterminable chela, In. 28060. It comes probably from the Vindobonian; the locality is unknown.

Discussion of the Fauna.

The following species are described above from the Maltese *Globigerina* Limestone (Lower Miocene, Burdigalian) :—

Ranina (*Ranina*) cf. *brevispina* Lörenthey (1 specimen).
Calappa heberti Brocchi (2).
Neptunus granulatus A. M.-Edw. (15).
Necronectes schafferi Glaessner (6).

The Crustacean fauna of the Upper Coralline Limestone Middle or Upper Miocene, Vindobonian) consists of the following species :—

Callianassa michelottii A. M.-Edw. (8 specimens, In. 28063–70).
Petrochirus priscus (Brocchi) (1, In. 28061).
Paguridæ, gen. et sp. indet. (3, In. 28062, In. 22636–7).
Maja sp. (4).
Cancer sp. (2).
Eriphia sp. (1).
Eriphia ? sp. (2).
Xanthidæ, gen. et sp. indet. (1).

The older Maltese fauna shows affinities to the Burdigalian faunas from Sardinia (*Neptunus* and *Calappa*), Northern Africa (*Ranina*), South-western France (*Calappa*), and the Vienna Basin (*Necronectes* and *Calappa*).

The Sardinian shallow-water fauna is much richer than the fauna of the *Globigerina* Limestone, which mainly consists of swimming crabs. These apparently lived in deeper water.

The younger Maltese fauna shows the assemblage of forms which are common to all deposits of Vindobonian age in the Mediterranean region (Sardinia, Italy, Touraine, Vienna Basin, Hungary). *Callianassa michelottii* occurs in Italy and Styria; *Petrochirus priscus* is known from Styria, Hungary, the Vienna Basin, and Northern Africa. Two Xanthid chelæ (*Eriphia* ? sp.) belong to a species known from the Helvetian beds of Touraine. The difference between the Burdigalian and Vindobonian faunas of Malta is due to the different conditions of life, changing in consequence of the shallowing of the sea in this region. It has no stratigraphical importance. In Italy some of the genera (*Maja*, *Cancer*, *Eriphia*) were still living during the Pliocene, and these are also found in the recent Mediteranean fauna.

MIOCENE BRACHYURA FROM PERSIA.

One Miocene crab is known from Persia, and two more are described here as new species.

Neptunus (*Achelous*) *withersi*, sp. n.

(Pl. II. figs. 1–3.)

Material.—(1) a large specimen showing the cephalothorax and abdomen, fragments of the right pereiopods including the swimming-leg and the third maxillipeds, In. 24479; (2) a cephalothorax, In. 24480; (3) a larger right chela, of which the proximal joint is missing and two-thirds of both fingers are broken off, In. 24481.

Distribution.—Miocene, Vindobonian, Lower Middle Fars Group, *Ostrea virleti* beds, Sulabadar, Persia (collected and presented to the British Museum by B. K. N. Wyllie, July 1920).

Description.—Carapace broader than long (1·5 : 1). Front with four nearly equal median teeth and two small fronto-orbital teeth. The two median teeth project only a part of a millimeter beyond the lateral. Orbits large, extraorbital tooth small. Antero-lateral spines triangular, apparently alternating in size with very small differences. The line connecting the last pair of marginal spines crosses the median line about 5 mm. behind its centre. Postero-lateral and posterior margins straight, without any thickened ridge. Gastral region not clearly marked, mesogastric lobe extremely narrow, gastro-cardiac and lateral cardiac grooves distinct. Surface of carapace covered with coarse granules. A similar granulation on the first sternal segment, the pterygostomian region, the third maxillipeds, and the chelipeds. The lower surface of the cephalothorax shows no features of specific value. The propodus of the chela has a blunt upper edge, three strong ridges on the outer surface, and two less prominent ridges on the inner side.

Measurements.—Holotype, In. 24479: length of carapace 55 mm., width of carapace 82 mm., width of front 14 mm. Chela: height 31 mm., length above 34 mm.

Comparison.—The subgenus *Achelous* is characterized by the length of the lateral pair of spines, which is about equal to the length of the other spines on the antero-lateral margin, while in the typical subgenus *Neptunus* it is much longer. *Achelous* differs from the allied genus *Scylla* by its long chelæ, which are ornamented with strong keels on both the inner and outer surfaces and on the upper margin.

Four Tertiary crabs seem to have been so far described as belonging to the subgenus *Achelous*. One of these, *A. delgadoi* Fontannes, is a *Scylla*, as Beurlen has recently pointed out. Another from the Miocene of Madagascar * is also a *Scylla*; it has no specific name. *A. obtusus* A. M.-Edw., from the Italian Oligocene, really belongs to this subgenus, while *A. krambergeri* Bittner could be as well considered as a *Scylla*, the chelipeds being unknown. The shape of the carapace, the direction of the antero-lateral margin, and the absence of finely granulated lines on the carapace distinguish the new species sufficiently from the others mentioned above.

By dedicating this species to Mr. T. H. Withers, Assistant-Keeper in the Geological Department of the British Museum, I wish to express my best thanks for his kind advice and most useful help in procuring the material for my research.

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* M. Collignon et J. Cottreau, "Paléont. de Madagascar.—XIV.," Ann. Paléont. xvi. 1927, p. 162, pl. xx. figs. 15, 19–21.

Heteropanope ? wylliei, sp. n.

(Pl. III. figs. 1–3.)

Material.—A complete cephalothorax with the chelipeds, In. 24482.

Distribution.—Miocene. Tang-i-Astaki, near Amiri, Lirawi District, N.N.W. of Bushire, Persia (collected and presented to the British Museum by B. K. N. Wyllie and J. V. Harrison, Sept. 1919).

Description.—Outline of carapace pentagonal, width almost equal to length. Front triangular, with a distinct median furrow. Orbits deep and narrow. Antero-lateral margin with four blunt teeth; the first and second scarcely visible, the fourth strong and directed outwards and upwards. The postero-lateral and posterior margins are straight, the latter only slightly thickened. The following regions can be seen on the carapace, and are separated by shallow grooves:—epi-, proto-, meso-, and metagastric; cardiac; hepatic; proto- and mesobranchial. There are no further divisions of these regions. Surface of the shell smooth. Sternum narrow. First segment shows a deep median furrow. Abdomen and legs not preserved. Only the chelipeds have been found in original connection with the body. They are of different size, the right one being stronger, and both are stout and rounded. The surface is smooth, but there are some granules on the outside of the lower proximal angle of the propodus and three very small and low nodes on the upper edge of the propodus. The dactylus has no prominent basilar tooth. Both finger-tips are pointed.

Comparison.—This species shows many affinities with the Indo-Pacific *Heteropanope serratifrons* (A. M.-Edw.). The shape of the front and of the chela and the disposition of the regions are very similar in both species. The new species is longer and narrower, the teeth are blunt and conical, not flattened and pointed as in *Panopeus*, *Heteropanope*, and many other Xanthids. The granulation and the nodes of the cheliped are missing in the recent species. As the antennal region could not be studied in the crushed and broken fossil specimen its generic position must remain doubtful.

Measurements.—Length of carapace 30 mm.; width 31 mm. Distance of fronto-orbital teeth 9 mm.; of extraorbital teeth 13 mm. Antero-lateral margin 16 mm.; postero-lateral margin 16 mm. Upper edge of smaller chela 9 mm.; of larger chela 10 mm.

I dedicated this species to Mr. B. K. N. Wyllie, who collected and presented the Persian Miocene Crustacea to the British Museum.

Actæa persica A. M.-Edw.

1865. *Actæa persica* A. Milne-Edwards, Ann. Sci. Nat. Zool. (5) iii. p. 344, pl. x. fig. 3.

1929. *Actæa persica* M. F. Glaessner, 'Fossilium Catalogus,' pt. 41, p. 50.

Locality.—" Ile Kharu prés Bushir " (*A. Milne-Edwards*).

Remarks.—No other specimen besides the holotype seems to have been discovered. As it was found not far from the type-locality of *Heteropanope* ? *wylliei*, which is Miocene, it was probably correctly considered as a Miocene fossil by A. Milne-Edwards, and it is not Pleistocene or subfossil as I suggested by error in my 'Fossilium Catalogus.' From the same locality A. Milne-Edwards obtained a specimen of a *Callianassa*, which he named *C. persica*, without describing it.

Discussion of the Fauna.

The crabs from the Persian Miocene are rather different from any European fauna. The subgenus *Achelous* is unknown in the Mediterranean Miocene, as are the Xanthid genera and even the subfamilies to which they belong. They show more of a tropical, Indo-Pacific character, although one species of *Heteropanope* occurs as a strange element in the recent fauna of the Atlantic Ocean. None of the common European Miocene crabs, such as *Calappa heberti*, *Neptunus granulàtus*, have been discovered in Persia. " *Neptunus* " *arabicus* Woodward *, from the Tortonian of the Mekran or Baluchistan coast, has only six antero-lateral teeth, and therefore belongs to the genus *Charybdis*.

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* H. Woodward, "Note on a Fossil Crab . . . ," Geol. Mag. n. s., Dec. 5, ii. p. 307, fig. 1.

INDIAN TERTIARY BRACHYURA.

A. Neogene.

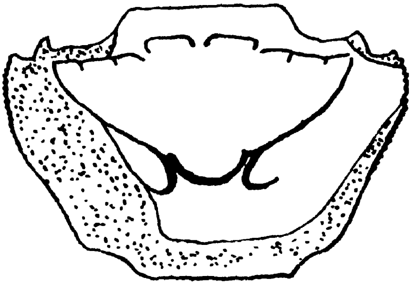
Potamon (*Potamon*) *sivalense*, sp. n.

(Pl. III. fig. 4 ; text-fig.)

Material.—Two specimens, one showing a fragment of the carapace, the other a complete female abdomen and parts of the legs.

Age and Locality.—Neogene, Siwalik Beds, Siwalik Hills. From the Cautley collection. In. 28074, In. 28075 (holotype).

Description.—Both specimens are in such a bad state of preservation that one can hardly point out any specific characters; but as the occurrence of true Potamonids or freshwater crabs in India at the same time as in the Mediterranean region is of high interest, it seems necessary to give a name to these fossils. We can only hope that after this publication new and better material will be found.



Potamon (*Potamon*) *sivalense*, sp. n.

Carapace, dorsal view; white part preserved, punctate parts restored. Holotype. Brit. Mus. In. 28075. × 2/3.

Only the median part of the carapace is preserved together with a fragment of the right lateral margin. The axial distance of the epigastric and frontal edges, which has a high systematic value in Potamonids, is 2 mm. The width of each of the epigastric regions is about 6 mm. The post-frontal ridge as a whole is slightly bent backwards, but its proximal part is convex and its distal part concave. The gastro-branchial grooves are very distinct for their whole length, and so is the posterior gastric groove. No limits of the urogastric lobe can be seen. The gastro-branchial groove is abruptly bent outwards at the angle of the cardiac region. The lateral borders seem to have borne small teeth (?).

The abdomen is clearly shown by the figure, and therefore it is unnecessary to give a full description. The length of the segments increases from the second to the sixth, as does the width. The sutures of the segments are slightly bent backwards at the point where they cross the median line.

Measurements.—Length of carapace about 31 mm.; width about 66 mm. Greatest width of abdomen 23·5 mm. (In. 28075), 30 mm. (In. 28074).

Comparison.—This Indian freshwater crab differs from the European Mio-Pliocene Potamonids * mainly in the disposition of the grooves of the carapace. Moreover, in these specimens the greatest width of the abdomen of the females lies on the fifth segment. There are several recent forms of *Potamon*, s. str., which have strong gastro-cardiac grooves and no distinct meso- and urogastric lobes; but the fossil Indian specimens of *Potamon* are not sufficiently well preserved to allow of a careful complete comparison with recent material. We are as yet unable to study the relations between *P. sivalense* and the recent tropical species of *Potamon*, s. str., but there is no doubt that the Indian fossil freshwater crab belongs to this subgenus.

B. Palæogene.

The Indian Palæogene crabs have been studied and carefully described by Stoliczka in 1871. The object of my research of these fossils is therefore not a palæontological but a stratigraphical revision, as their age was practically unknown. By studying the modern literature on the Indian Tertiary and by comparing the matrix of the specimens I am able to fix the age of the Indian Palæogene crabs to different degrees of certainty. Moreover, I found in the collection of the British Museum two new species and specimens of two species which are not known from the Indian Tertiary.

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* *P. speciosum* (v. Meyer), *P. quenstedti* (Zittel), *P. proavitum* Glaessner, *P. castellinense* Szombathy, *P. antiquum* Szombathy. See Glaessner, 1929 *a*, pp. 168–174.

Description of new Species.

Lobocarcinus indicus, sp. n.

(Pl. III. figs. 6, 7 ; Pl. IV. fig. 1.)

Material.—The holotype (In. 28125) is a male specimen. It shows the carapace, the right cheliped, and parts of the sternum and abdomen ; the left side is broken off. A female specimen shows the cephalothorax, legs, and the right chela (In. 28126). Another specimen consists of a cephalothorax and the right cheliped (Pl. III. fig. 7) (In. 28127). Two other specimens consist of the cephalothorax only, with the margins broken off (In. 28128–29), and there are some fragments of legs and chelæ (In. 28130–33).

Distribution.—White marly nummulitic limestone (Kirthar), Lutetian, Dera Bugti District, Baluchistan.

Description.—This species is so closely allied to the common Egyptian *Lobocarcinus paulino-wuerttembergensis* v. Meyer that it is unnecessary to give a full description. Only the differences are here pointed out.

Lobocarcinus indicus :

Teeth of the antero-lateral border drawn out into long, slender, pointed, hollow spines.

Four spines on both sides of the posterior margin above each of the bases of the fifth pereiopods. Distinct median spine.

Surface of the carapace in all stages of growth smooth, with no nodes.

Distance of the horseshoe-like lateral cardiac grooves behind the urogastric region small, less than two-thirds of the distance in equally large specimens of *L. paulino-wuerttembergensis*.

Outer surface of chela with a row of spines on the upper edge one row of two and two of three spines below.

Lobocarcinus paulino-wuerttembergensis :

Teeth triangular, length not exceeding width at the base.

Three spines on each side of the posterior margin, median spine missing or indistinct.

Nodes on the surface of the carapace distinct, at least in young specimens.

Distance of lateral cardiac grooves as in other crabs, more than one-tenth of the distance between the bases of the lateral teeth.

Outer surface of the chela with two ranges of spines near the upper edge.

One of these differences alone would not justify the creation of a new species, but taken together they give to the Indian specimens an appearance sufficiently different from the well-known character of the Egyptian species. There is no doubt that both have the same origin. Here the interesting fact may be mentioned that a typical specimen of the Egyptian species has been found in Hungary, far north from the type-locality.

Measurements.—Holotype (In. 28125): length of carapace without frontal teeth 51 mm.; width about 96 mm.; width at the base of the last marginal group of spines 84 mm.; distance of extraorbital teeth 30 mm.; distance of inner orbital teeth 13·5 mm. In. 28127: length of carapace 56 mm.; width at the bases of last marginal spines 88 mm.; distance of extraorbital teeth 34 mm.

Goniocypoda sindensis, sp. n.

(Pl. III. fig. 8.)

Material.—Three specimens consisting of the carapace and fragments of the legs. Coll. Major Rocke. In. 28077 (holotype), In. 28078–79.

Distribution.—Probably Eocene. The specimens are preserved in light brown nodules of hard marl. They come from Sind; the exact locality is unknown.

Description.—As the new species has most of the features of the type-species, *Goniocypoda edwardsi* H. Woodward, from the London Clay of Portsmouth, it seems to be sufficient to point out only the differences.

The proportion of the fronto-orbital margin to the whole width is more than 1 : 1·4 in *G. edwardsi* and 1 : 1·7 in *G. sindensis.* The lateral margins are nearly straight in the former and distinctly convex in the latter. The regions of the carapace are more clearly limited in the Indian species. The protogastric lobes are much broader (1 : 1·7 compared with the width of the carapace) than in *G. edwardsi* (1 : 2·3). *Goniocypoda transsilvanica* Bittner, which has been found in the Lutetian of Hungary and in the Upper Eocene of Egypt, has a short and broad carapace with a long fronto-orbital margin and without distinct grooves.

Measurements.——Holotype (In. 28077): length of carapace 12 mm.; width 16 mm.; fronto-orbital margin 9 mm.; orbit 3–4 mm. In. 28078: length 14 mm.; width 18 mm. In. 28079: length 12·5 mm.; width 17 mm.

Stratigraphical Distribution of the Indian Tertiary Crabs.

(1) The following species come from the Lutetian (Middle Eocene) of Baluchistan, Sind, and Kachh:—

Ranina (*Lophoranina*) *bakeri* A. M.-Edw. *.
Lobocarcinus indicus, sp. n.
Palæocarpilius simplex Stol.
Galenopsis murchisoni A. M.-Edw.

(2) Two species from the Eocene of Sind are represented in the collection of the British Museum, but have not been cited till now in the literature. Their exact localities are unknown:—

Galenopsis cf. *typicus* A. M.-Edw.
Goniocypoda sindensis, sp. n.

(3) Two species of crabs occur in Oligocene (Aquitanian ?) deposits in Sind. It is impossible at the present time to find out their exact age:—

Scylla sindensis (Stol.) †.
Myra sp. (In. 28124).

(4) Three species have been found in a widespread fossiliferous bed in Kachh. Its age has been considered by the late Dr. Vredenburg as Aquitanian. Still there is some doubt about the stratigraphical position of these beds; but as the exact horizon and localities are known

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* See T. H. Withers, 1932, p. 468, pl. xiii. figs. 3–5.

† This species is said to come "from a yellowish Nummulitic Limestone in the Lukee (=Laki) Hills in Sind" (Stoliczka, p. 7). This is apparently an error. The four specimens from the Baker Collection are not preserved in a yellowish Nummulitic Limestone, as *Galenopsis* etc., but in a brown sandy limestone.

in this case, we can hope that the stratigraphical question will soon be solved. The species are :—

Typilobus granulosus Stol. *.
Neptunus wynneanus Stol.
Palæocarpilius rugifer Stol.

They make an Aquitanian age of the bed very probable.

Now we are able to make a clear distinction between two faunas in the Indian Lower Tertiary (including the Aquitanian) :—

Eocene.	Oligocene.
Ranina (Lophoranina) bakeri.	*Myra* sp.
Lobocarcinus indicus.	*Typilobus granulosus.*
Palæocarpilius simplex.	*Scylla sindensis.*
Galenopsis murchisoni.	*Neptunus wynneanus.*
Galenopsis cf. *typicus.*	*Palæocarpilius rugifer.*
Goniocypoda sindensis.	

They have nothing in common except the genus *Palæocarpilius*, which in Europe links up in the same way the Eocene and Oligocene faunas. It is remarkable that all the Eocene genera are known in Europe. The uniformity of the Eocene fauna all over the world is apparently due to the great transgression in the Middle Eocene. *Typilobus* is first mentioned from the European Eocene; *Myra*, *Scylla*, and *Neptunus* have never been found in deposits older than Oligocene.

UPPER TERTIARY BRACHYURA FROM JAPAN.

Only one species of a fossil crab is known from the Japanese Upper Tertiary. It has not been figured, and its description has met with no attention by later authors. A new species is here described.

Carcinoplax antiqua (Ristori).

(Pl. IV. fig. 3.)

1889. *Curtonotus antiquus* G. Ristori, Atti Soc. Toscana Sci. Nat., Proc. Verb. vii. pp. 4–6.

Material.—Three specimens, two of them in the collection of the British Museum (I. 3470 and In. 28586). The crabs are included in hard grey nodules of marly limestone. The nodules have a perfectly smooth surface and seem to have been rolled, or, more probably, artificially polished.

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* T. H. Withers, "A new Crab from the Miocene of Sinai," Petrol. Research Bull. Min. of Finance, Egypt, nr. 9, pp. 37–40, pl. iii. (1925).

Locality.—The locality at which the four type-specimens were found is unknown. The specimen I. 3470 is labelled "Near Akita, North Japan." The other specimens at my disposal were sent to me by the late Professor Y. Ozawa, who gave me the following particulars of the locality:—"The specimens preserved in marl nodules are from the younger Tertiary developed in the Province of Mutsu, northern extremity of Honshû or Hondò. The nodules are found in light grey or yellowish shale, which contains abundant marine shells such as *Vicarya*, etc." *.

Age.—According to Prof. Ozawa the geological age of the shale "is generally considered to be the uppermost Miocene"; but in several papers the *Vicarya*-shales and *Desmostylus*-beds are placed in the Burdigalian †. Ristori's specimens were found in nodules of hard and compact grey limestone. The nodules are rolled and seem to have been found in torrential deposits. Ristori (p. 4) states:—"This supposition is the more likely because De Haan, in his 'Fauna Japonica,' p. xxvii, mentioned fossil Crustacea found among pebbles in beds of torrents and streams." This is evidently a confusion, for De Haan had in mind not the crabs from the *Vicarya*-beds, but the subfossil fauna with *Macrophthalmus latreillei* Desm. found frequently in concretions at the beaches and in the estuaries all over the Indo-Pacific Region.

Description.—Ristori gives the following description of the species:—"Carapace rhomboidal in outline and similar to that of *Gonoplax*, especially in the males, but more rounded and with blunter angles in the young females. Regions not very clearly marked, but always very similar in disposition and form to those of *Gonoplax*.

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* See H. Yabe, "Recent Stratigr. and Pal. Studies of the Japanese Tertiary," Proc. 1st Pan-Pacific Sci. Conf. (1920), Honolulu, 1921, p. 780. Speaking of Fukuoka District, Prov. of Mutsu, Honshû, Prof. Yabe says:—"3. Yuda Group, *b*, light grey or yellowish shale with thin bands of rather incoherent sandstone, and numerous marl nodules; very fossiliferous. *Vicarya* cfr. *callosa* Jenkins and *Desmostylus* sp. are two noteworthy fossils from it."

† H. Matsumoto, "Mammalian Horizons of the Japanese Tertiary etc.," Proc. Pan-Pacific Sci. Congr., Australia, 1923, 1, pp. 890–892 (1925 ?).

Frontal lobe produced and slightly incurved. Ocular lobes slightly raised. Frontal furrow bifurcated, not much marked, and not very deep. Orbits oval, deep, and their upper margin raised, corresponding with the produced part of the frontal lobe. The development of the orbits shows that the eye-stalks could not have been very long, but rather thick. Mesogastric lobe not clearly distinct. Urogastric region well defined by the posterior gastric and anterior cardiac furrow and laterally by the lateral cardiac furrows. They are all formed like arches, with the convexity directed towards the middle of the urogastric region. Frontal margin smooth, antero-lateral margins with spines at the outer end of the orbit and near the middle of their length *. Postero-lateral margins rather oblique and converging behind; they begin at a marginal spine, the base of which is raised slightly above the neighbouring area of the carapace, and which resembles the second spine of the living *Gonoplax bispinosa.* Posterior margin with a ridge, convex posteriorly.

Male abdomen straight and very similar to that of *Gonoplax*; female abdomen much broader and well distinguished from that of the living genus.

Chelipeds long and robust in the male, shorter but equally robust in the female. Manus long and cylindrical, with long fingers which are curved and armed with many teeth. There is a small node on the distal part of the inner surface of the propodus, not mentioned by Ristori.

Comparison.—Ristori compares his species with two Japanese species of "*Curtonotus*" †, described by De Haan, and comes to the following result:—"The form of the carapace is more clearly trapezoidal in the fossil specimens, and therefore the angles are more apparent and acute. In the appendages the new species is clearly intermediate between the two species described by De Haan. In the chelæ, the chelipeds, and the abdomen it is similar to *Curtonotus longimanus*; in the contour and in the ornamentation of the margins of the carapace and in the disposition and form of the regions it approaches more to the second species, *C. vestitus* . . . This new species of *Curtonotus* appears to be really intermediate between the two species described by De Haan. I call it *C. antiquus* and consider it as the ancestral type of the two living forms."

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* Not translated verbally, as the description is not clear and probably erroneous. The names of regions and furrows are adjusted according to modern use.

† *Curtonotus* De Haan, nom. præocc.=*Carcinoplax* H. M.-Edw.

It is impossible to insist any longer on this statement, as it has been shown by later authors that one of the cited species cannot be included in *Carcinoplax*. "*Curtonotus*" *vestitus* De Haan belongs to *Pilumnoplax*, a genus which has a wide range in recent seas and fossil deposits. The species described by Ristori is a true *Carcinoplax*, and probably has been correctly called the ancestral type of *C. longimana* De Haan. The characters which seem to prove an affinity to *Pilumnoplax vestita*—*e. g.*, the more markedly hexagonal outline of the cephalothorax and the strong pointed teeth—must be generally considered as characteristic features of primitive Goneplacids (Carcinoplacids).

Carcinoplax antiqua is a characteristic and apparently rather common fossil of the *Vicarya-Desmostylus*-beds. I saw many specimens of it in other European collections.

Scylla ozawai, sp. n. (Pl. IV. fig. 2.)

Material.—A cephalothorax with the chelipeds, included in a nodule of fine greenish-grey sandstone containing small coal-particles (I. 3469).

Locality.—The specimen is labelled "Near Akita, North Japan," as is also one of the British Museum specimens of *Carcinoplax antiqua.*

Age.—Miocene, possibly *Vicarya*-beds (Lower Miocene).

Description.—A typical *Scylla,* not much different from the common recent and subfossil * Indo-Pacific *Scylla serrata* Forskål. The principal difference lies in the ornamentation. The whole surface of the carapace and sternum is covered with a fine granulation which can be seen without a lens. The size of the tubercles increases near the centre of the branchial regions. The ridges on the epigastric and protogastric lobes are not formed by larger tubercles, but by a slight elevation of the carapace. A transverse granulated ridge is found on the pterygostome. The colour of the shell is dark brown, with light brown spots near the antero-lateral and frontal margins.

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* Recently *Scylla serrata* was said to have been found in the Miocene. See H. Ch. Das-Gupta, 1925, "On the Occurrence of *Scylla serrata* in the Upper Tertiary Beds at Hathab, Bhavanagar (Hathiawar)," Journ. Proc. Asiat. Soc. Bengal, n. s. xx. p. 239, pl. x.

On the inner surface of the chela there is a blunt ridge. The chela is coloured brown with some white spots. The finger-tips are black.

Measurements.—Width of carapace between the lateral spines 92 mm.; length of carapace without frontal teeth 50 mm.; width of fronto-orbital margin 38 mm.

Comparison.—The new species is much broader than *Scylla sindensis* (Stoliczka) and *Scylla delgadoi* (Fontannes), and differs from both species by the granulation and ridges on the surface. It seems to be nearer related to the recent species.

Acknowledgment.—The name of the new species is given in honour of the late Professor Y. Ozawa, of Tokyo, who directed my attention to the fossil crabs of Japan, and a few months before his premature and deplorable death sent me several interesting specimens.

TERTIARY BRACHYURA FROM SOUTH AMERICA.

The large common crab from the "Patagonian Molasse" was discovered by A. d'Orbigny in 1842, and redescribed in the following years under different names. An interesting fauna from Chile was figured and briefly described by R. A. Philippi in 1887. G. Colosi, in 1924, dealt with a new genus and species from Tierra del Fuego. The collection of the British Museum contains a large number of well-preserved crabs from Patagonia, including all the known and two hitherto unknown species from this region.

Majidæ, gen. et sp. indet.

Material.—A large fragment of the anterior part of the carapace, included in a hard grey sandstone (In. 28025). Large chelæ and fragments of the chelipeds, included in hard grey fossiliferous sandstone, with *Nucula* etc. (In. 28009–21).

Age and Locality.—Miocene, Patagonian Beds. Santa Cruz, Argentina.

Remarks.—This crab appears to belong to a new genus, but it is not sufficiently well preserved to be named and fully described. It is similar to the recent genus *Libinia*, but it has two spines instead of one on the urogastric region. The carapace is covered with long hollow spines. The chelæ are large and smooth. The immovable finger is short and curved inwards. Both fingers are provided with a blunt tooth at the base and a sharp cutting-edge.

Archæogeryon peruvianus (d'Orbigny).
(Pl. V. figs. 1, 2.)

1842. *Portunus peruvianus* A. d'Orbigny, Voy. Amer. Mer., Pal. iii. III. p. 107, pl. vi. fig. 17.
1849. *Podopilumnus peruvianus* F. McCoy, Ann. & Mag. Nat. Hist. (2) iv. p. 66.
1860. *Carcinus peruvianus* A. Milne-Edwards, Ann. Sci. Nat. Zool. (4) xiv. p. 269, pl. viii. fig. 1.
1887. *Cancer patagonicus* R. A. Philippi, Tert. Quart. Verst. Chiles, p. 220, pl. l. fig. 1.
1902. *Geryon ? peruvianus* A. E. Ortmann, Rep. Princeton Univ. Exped. Patagonia, iv. Palaeont. I. p. 255, pl. xxxviii. fig. 6.
1929. *Geryon peruvianus* M. F. Glaessner, Foss. Catalogus, pt. xli. p. 182.

Distribution.—Miocene, Patagonian Beds, Argentina and Tierra del Fuego. Localities: Monte Leon; Lago Posadas (Santa Cruz); Puerto Piramides (Chubut); Bahia Solano (Comodoro Rivadavia, Chubut). Localities cited by Ortmann: Mouth of Santa Cruz River; Mt. of Observation; San Julian; Darwin Station; Lake Pueyrredon. Locality mentioned by Steinmann and Wilckens (Arkiv f. Zoologi, Stockholm, vol. iv. 1908, p. 86): Cliff of Sierra de Carmen Silva, southern shore of Bahia San Sebastian.

Material.—Thirteen males, most of them well preserved; one female; two specimens without abdomen; an isolated chela; a fragment of a finger (In. 28001–7, In 27384–7, In. 28024, In. 28026, In. 28034–6, In. 28288).

Remarks.—All details are shown in the photograph of the most completely preserved specimen; but it seems necessary to point out especially two features: (1) the presence of an indistinct prominence on each of the hepatic regions, and (2) the shape of the last pair of pereiopods. While the merus is normal, the carpus and propodus are flattened, and so is the dactylus, but its tip being broken off it is impossible to say whether it was lanceolate and pointed or broadly oval. This leg is adapted for swimming and digging, but it is not so highly specialized as the corresponding pereiopod in the Portunids. This feature makes it impossible to include the species in the genus *Geryon*, which is very similar in the shape of carapace, front, and chelæ. But the transformation of legs, being a merely adaptive character, does not exclude the Patagonian crab from the family Geryonidæ Colosi, 1924. The presence of the hepatic spines and of longitudinal branchial ridges demonstrates the relationship of the species with *Archæogeryon fuegianus* Colosi, which differs from *A. peruvianus* by the width of the cephalothorax, the still greater length of the orbits and eye-stalks, and the distinctness of the prominences and furrows on the carapace.

Archæogeryon fuegianus Colosi.

(Pl. V. fig. 3; Pl. VI. figs. 1–3.)

1924. *Archæogeryon fuegianus* G. Colosi, Boll. Soc. Natural. Napoli, xxxv. p. 249, fig.

Distribution.—Miocene, Patagonian Beds, Santa Cruz, Argentina. Type-locality: Cape San Pablo, Tierra del Fuego. Other localities, after Colosi: Cerro della Lena, Cape Sunday.

Material.—Two males, two females, and two incomplete specimens. Five of the specimens preserved in nodules of fine hard sandstone, one in soft marl (In. 28022, In. 28023, In. 28027–30).

Remarks.—This species is characterized not only by the width of its carapace and orbits, and by the spines of its antero-lateral margin, but also by the hepatic spines, the longitudinal branchial ridges, and the coarse granulation of all prominent parts of the carapace. In a female specimen we find two keels on the upper side of the chela, one on the outer surface, and one on the lower edge. In the males the chelæ are almost smooth. The last pair of legs not preserved. The species is probably identical with "*Cancer*" *tyro* Philippi from the Miocene of Chile.

Archæogeryon latus, sp. n.

(Pl. V. figs. 4, 5; Pl. VI. fig. 4.)

Diagnosis.—Front only one-sixth the width of the carapace. Width of orbits about half the length of the carapace. Four antero-lateral teeth.

Distribution.—Miocene, Patagonian Beds, Santa Cruz, Argentina.

Material.—Two males and two females, legs not preserved. Calcareous sandstone (I. 4580, In. 28008, In. 28032 (holotype), In. 28033).

Description.—Cephalothorax very wide. Front narrow, notched, not completely preserved. Orbits very long, transverse. Two supraorbital fissures. Antero-lateral margin very short, almost straight, bearing only four teeth. The second tooth of *A. fuegianus* is missing in the new species (reduction in consequence of the shortening of the antero-lateral margin). Hepatic tubercle and branchial ridges distinct. Carapace covered with coarse granules. Ventral surface of cephalothorax smooth.

This represents the highest stage of evolution reached in the genus *Archæogeryon*, the relative width of the cephalothorax increasing gradually from *A. peruvianus* to *A. fuegianus* and from this to *A. latus*. It would be interesting to know whether these three species, which are preserved in different kinds of rock, occur in stratigraphically different beds in the Patagonian series, according to their height of specialization. *A. peruvianus* is known to occur from the base to the top of the Patagonian Beds.

Measurements.—Holotype: length of carapace about 35 mm.; width 51 mm.; front 8 mm.; orbit 17 mm. Specimen I. 4580: length of carapace 26 mm.; width 37 mm.; front 5 mm.; orbit 13 mm.

Pseudorhombila patagonica, sp. n.
(Pl. III. fig. 5.)

Distribution.—Miocene, Patagonian Beds, Santa Cruz, Argentina.

Material.—A single carapace, preserved in fine sandstone (In. 28031).

Description.—Carapace broadly oval, the proportion of length to width being 1 : 1·42. Convex axially, completely flat transversely. Front broken. Orbits very small. A row of small granules and two fissures on the upper orbital margin. Four antero-lateral teeth, the first and fourth very small, the second and third equal in size, the third the most projecting. Lateral gastric, cardiac, and hepatic grooves faintly indicated. Surface covered with fine granules, which grow larger near the lateral margins. Buccal frame very slightly widening anteriorly. On the pleuræ of the carapace there is a most conspicuous elevation, beginning at the posterior angle of the buccal frame and running transversely across the pleuræ to the pleural suture.

Measurements.—Length of carapace 21·5 mm.; width 30·5 mm.; width of front 9 mm.; fronto-orbital margin 14 mm. Distance of last tooth from extra-orbital angle (=antero-lateral margin) 12 mm.; postero-lateral margin 12 mm.; posterior margin 16 mm.

Discussion of the Fauna.

The crab fauna of the Patagonian Beds is entirely different from what we usually find in Miocene Beds. Its main element, the genus *Archæogeryon*, is nearly related to *Cœloma*, *Litoricola*, and *Paracœloma* from the European (mainly North European) and North American Eocene and Lower and Middle Oligocene. If *Portunites* really belongs to the Geryonidæ—and many features seem to prove this view—then we find a remarkable affinity to the North American Oligocene fauna, which contains two species of *Portunites* and several Pseudorhombilinæ. The South American Miocene Decapod fauna shows a primitive type like the Palæogene fauna of Europe and North America. There are no typical Eocene forms, neither are there any characteristic Miocene genera or species. *Archæoplax signifera* Stimpson, from the Miocene of Gay Head, Mass., is the only Miocene crab which is essentially similar to *Archæogeryon*. But for the occurrence of *Archæoplax* together with *Cancer* in a typical North American Miocene fauna we should consider the Patagonian "*Archæogeryon* fauna" as Oligocene. For that reason only can we agree to the statement recently published by W. B. Scott *, who, based on True's work on the whales of the Patagonian beds, considers the age of these beds as Miocene. The Patagonian crab fauna has nothing in common with the contemporaneous West Indian and Gatun fauna. The inhabitants of the Patagonian sea differed much more from those of the Miocene tropical sea than those of the northern parts of Europe found in the Miocene " Glimmerton " of Sylt (*Portunus*, sp. n., Pseudorhombilinæ, gen. et sp. indet.) and of other localities (*Micromithrax holsatica* Noetling) from the well-known crabs living at the same time in the Mediterranean Region.

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* W. B. Scott, "Nature and Origin of the Santa Cruz Beds," Rep. Princeton Univ. Exped. Patagonia, vii., Palæont. iii. pp. 193–4 (1932).

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EXPLANATION OF THE PLATES.

PLATE I.

Necronectes schafferi Glaessner.

Miocene, Burdigalian, *Globigerina* Limestone : Malta.

Fig. 1. Plaster cast of carapace and chelipeds. Front restored. Brit. Mus. (cast of In. 28049 *b*). Nat. size.

Eriphia sp.

Miocene, Vindobonian ? : Malta.

Fig. 2. Left chela, partly restored. Brit. Mus. In. 28052. Nat. size.

PLATE II.

Neptunus (*Achelous*) *withersi*, sp. n.

Miocene, Lower Middle Fars Group : Sulabadar, Persia.

Fig. 1. Cephalothorax with fragments of legs, seen from above. Left side restored. Holotype. Brit. Mus. In. 24479. Nat. size.
Fig. 2. Ventral surface of same.
Fig. 3. Right chela, partly restored. Brit. Mus. In. 24481. Nat. size.

PLATE III.

Heteropanope ? *wylliei*, sp. n.

Miocene : Tang-i-Astaki, near Amiri, Lirawi District,
N.N.W. of Bushire, Persia.

Fig. 1. Cephalothorax and chelipeds. Dorsal view. Holotype. Brit. Mus. In. 24482. Nat. size.
Fig. 2. Ventral view of same.
Fig. 3. Frontal view of same.

Potamon (*Potamon*) *sivalense*, sp. n.

Neogene, Siwalik Beds : Siwalik Hills, India.

Fig. 4. Abdomen and fragments of legs. Holotype. Brit. Mus. In. 28075. Nat. size.

Pseudorhombila patagonica, sp. n.

Miocene, Patagonian Beds : Santa Cruz, Argentina.

Fig. 5. Carapace. Dorsal view. *FO*, width of fronto-orbital margin ; *F*, width of front. Holotype. Brit. Mus. In. 28031. Nat. size.

Lobocarcinus indicus, sp. n.

Middle Eocene, Nummulitic (Kirthar) Limestone,
Dera Bugti District, Baluchistan.

Fig. 6. Carapace. Dorsal view. Brit. Mus. In. 28129. Nat. size.
Fig. 7. Right chela. Partly restored. Brit. Mus. In. 28127. Nat. size.

Goniocypoda sindensis, sp. n.

Eocene : Sind, India.

Fig. 8. Carapace. Dorsal view. Holotype. Brit. Mus. In. 28077. × 2.

PLATE IV.

Lobocarcinus indicus, sp. n.

Middle Eocene : Dera Bugti District, Baluchistan.

Fig. 1. Carapace. Dorsal view. Left side restored. Holotype. Brit. Mus. In. 28125. Nat. size.

Scylla ozawai, sp. n.

Miocene : near Akita, North Japan.

Fig. 2. Carapace. Dorsal view. Margins restored. Holotype. Brit. Mus. I. 3469. Nat. size.

Carcinoplax antiqua (Ristori).

Miocene, Burdigalian, *Vicarya-Desmostylus*-Beds :
Province of Mutsu, Northern Honshû, Japan.

Fig. 3. Carapace and chelipeds. Dorsal view. Right posterior margin restored. Brit. Mus. In. 28586. Nat. size.

PLATE V.

Archæogeryon peruvianus (d'Orbigny).

Miocene, Patagonian Beds : Santa Cruz, Argentina.

Fig. 1. Complete specimen. Dorsal view. Brit. Mus. In. 28002. × ½.
Fig. 2. Ventral view of same.

Archæogeryon fuegianus Colosi.

Miocene, Patagonian Beds : Santa Cruz, Argentina.

Fig. 3. Chelæ of ♀. Brit. Mus. In. 28029. Nat. size.

Archæogeryon latus, sp. n.

Miocene, Patagonian Beds : Santa Cruz, Argentina.

Fig. 4. Carapace. Dorsal view, ♀. Brit. Mus. In. 28032. Nat. size.
Fig. 5. Cephalothorax. Ventral view, ♂. Brit. Mus. In. 28033. Nat. size.

PLATE VI.

Archæogeryon fuegianus Colosi.

Miocene, Patagonian Beds : Santa Cruz, Argentina.

Fig. 1. Male specimen, showing carapace, eye-stalk (*E*), and legs. Tips of frontal spines restored. Brit. Mus. In. 28027. Nat. size.
Fig. 2. Ventral view of same, showing sternum and abdomen ; fragments of legs ; right immovable finger of chela ; third maxillipeds.
Fig. 3. Right chela of male. Finger-tips restored. Brit. Mus. In. 28028. Nat. size.

Archæogeryon latus, sp. n.

Miocene, Patagonian Beds : Santa Cruz, Argentina.

Fig. 4. Carapace. Dorsal view. Right side restored. *FO*, fronto-orbital margin ; *F*, front. Holotype. Brit. Mus. I. 4580.

II.—*Descriptions of Two new Parasitic Nematodes from a West African "Hairy Frog"* (Ranidæ).

By J. H. SANDGROUND, Museum of Comparative Zoology and Department of Tropical Medicine, Harvard University.

IN the course of studying the material in the extensive herpetological collection of the Museum of Comparative Zoology at Harvard University parasites are occasionally encountered and are submitted to the writer for identification. Protruding from the mouth of a specimen of the so-called "hairy frog" of the Cameroon rivers—*Astylosternus robustus* (Boulenger)—the Associate Curator, Mr. Arthur Loveridge, found two specimens of what appears to be a new species of the Ascarid genus *Amplicæcum*. In order to secure a larger series of this species the writer dissected six more specimens of the host, thereby uncovering, in addition to several specimens of the *Amplicæcum*, two types of Oxyuroid nematodes, at least one of which also appears to be new. The descriptions of these worms are here presented.

Superfamily **ASCAROIDEA**.

Family **Heterocheilidæ**.

Genus AMPLICÆCUM Baylis, 1920.

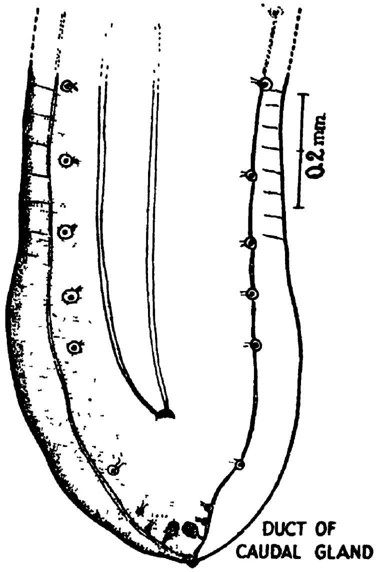
Amplicæcum novempapillatum, sp. n.

The dimensions (in millimetres) of the structures that have been utilized for taxonomic purposes in the genus are tabulated below :—

	Male.	Female.
Length	19–23	42–43
Greatest width	0·6–0·7	1·2
Œsophagus	2·3–3·4	5·1–5·7
Intest. cæcum	1·6–2·4	4·1
Tail	0·26–0·35	0·27
Spicules	1·15	
Caudal papillæ	preanal, 9 pairs postanal, 3 pairs	
Vulva from head ..	....	15·0
Eggs	....	0·125 by 0·085

In so far as the morphological characters of such organs as the lips etc. have not been found to differ significantly from one species of this genus to another, the above dimensions appear to be all that is necessary for the consideration of the systematic status of the species. In the male there are very definite wing-like expansions of the ventral caudal cuticle (fig. 1). These expansions, though they do not extend more than 0·08 mm. from the periphery of the cylindrical body of the worm, are to be described as true alæ originating near the tip of the tail to become broadest at the level of the cloaca and becoming confluent with the body some 0·5 mm. in front of the cloaca. Such caudal expansions, on to the surface of which the end-organs of the papillæ project, are described in *Amplicæcum africanum* Taylor, 1924 (believed by the present author to be a synonym of *A. involuta* Gedoelst, 1916), and will, I think, be found in other species of the genus, even though they are not apparent when the coiled tail is viewed, as it usually is, from the side.

Fig. 1.



Amplicæcum novempapillatum, sp. n.
Caudal end of male ; ventral view.

The genus *Amplicæcum* is a very homogeneous one. As shown by Khalil (1926) the five or six species comprising the genus are distinguished mainly by size differences. To what an extent variability may obliterate the distinctions now drawn between several of the species on the basis of body proportions cannot be foretold, but must nevertheless be borne in mind as a distinct possibility. So far as concerns the caudal papillæ in three male specimens available to us their number was found to be constant. The presence then of nine large preanal papillæ, together with spicules somewhat larger than have previously been described for any species, is presented as distinctive of the species, for which the name *A. novempapillatum* is proposed. The species is undoubtedly closely allied to *A. gedoelsti* Yorke and Maplestone, 1926.

Superfamily **OXYUROIDEA.**

Family **Heterakidæ.**

Genus AFRICANA Travassos, 1920.

Africana astylosterni, sp. n.

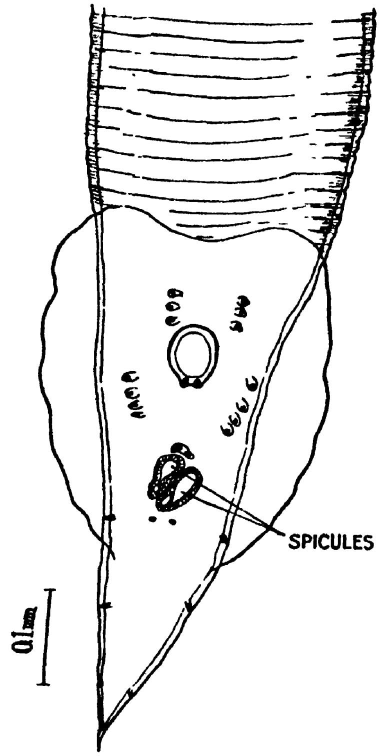
The range of measurements secured from half a dozen specimens of each sex of this species is given in the accompanying table :—

	Male.	Female.
Length	4·4–5·0	4·5–5·2
Greatest width	0·33–0·38	0·27–0·44
Pharynx	0·058	0·054
Œsophagus	0·7–0·9	0·6–0·72
Dimensions of bulb .	140 μ × 130 μ	150 μ × 100 μ
Tail	0·22	0·29
Spicules	1·9–1·95	
Ventral sucker......	52 μ × 42 μ	
Head to vulva / Vulva to tail	....	2·3–2·5 / 1
Eggs	....	65–72 μ × 36 μ

The tail of the male (fig. 2) is subulate and acutely pointed. Caudal alæ, with contour somewhat crenated in the preserved material, present; they originate some distance posterior to the cloaca and unite on the ventral surface of the body about 0·3 mm. anterior to the cloaca. The ventral sucker is ovoid in outline ; its posterior border is notched and accommodates two small papillæ. The caudal papillæ are all sessile ; their relatively small size and the fact that their terminal organs are scarcely elevated above the surrounding surface makes them very inconspicuous. It is therefore possible that, in addition to the twelve pairs of papillæ indicated in fig. 2, other smaller papillæ, which escaped our observation, are present. The spicules are substantially broad and subequal. Their surfaces are strongly marked with a honeycomb pattern. As shown in the cross-section that is exposed when the spicules break the spicules are tubular rather than fluted.

The genus *Africana*, comprising the following three species—*A. africana* (Gendre, 1909), *A. acuticeps* (Gedoelst, 1916), and *A. brodeni* (Gedoelst, 1916)—is parasitic almost exclusively in lizards and tortoises. The present species is apparently the first to be found in a frog. In its general morphology it corresponds essentially with what has been described for the type-species. An extensive description is thus rendered superfluous. The measurements of the species that have already been

Fig. 2.



Africana astylosterna, sp. n.

Caudal end of male ; ventral view, showing cross-section of broken-off spicules.

described coincide or overlap to a great extent, and, as Taylor (1924) has observed, the number and arrangement of the caudal papillæ appear to present the only differences of diagnostic value. While possessing a distinctive pattern of caudal papillæ *Africana astylosterni* can apparently also be differentiated by the relatively posterior position of the vulva in the female. The precaudal sucker of the male seems also to be significantly smaller than in previously described species.

Oxysomatium ? chamæleonis Baylis, 1929.

In addition to the two species described above a second oxyuroid, belonging to the genus *Oxysomatium* Railliet and Henry, 1913, was obtained in abundance from the same host. However, because of the close resemblance that the species bears to several species already described in the genus, I am not prepared to name it definitely without recourse to comparison with material of the other species. In the number and arrangement of its caudal papillæ it agrees with *O. chamæleonis* Baylis, which was described from an East African chamæleon, but in the possession of distinct scythe- or hook-shaped membranes at the tip of its spicules and slight alæ at the level of the cloaca it differs from the aforenamed species to coincide with *O. hylambatis* Baylis (from a West African tree-frog). It differs, however, from *O. hylambatis* in the arrangement of its caudal papillæ. Again, it shows several important points of resemblance with *O. perezi* (Gendre, 1911), which Baylis acknowledges to be closely related to his species. If the shape of the terminal membrane on the spicule-sheath depends on the angle of vision, as there seems to be reason to believe, our material can readily be accommodated under the specific designation *O. chamæleonis*.

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III.—*The Fishes (other than* Cichlidæ) *of Lake Bangweulu and adjoining Regions, including Descriptions of Three new Species.* By E. B. Worthington, M.A., Ph.D., Zoological Laboratory, Cambridge.

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INTRODUCTION.

The object of this paper is threefold :—(1) To report on a collection of fishes from Northern Rhodesia, made in 1931–32 by Capt. C. R. S Pitman, while he was in charge of game and faunistic investigations in that country carried out on behalf of the Government; (2) to furnish an up-to-date list of the non-Cichlid fishes recorded from the region of Lake Bangweulu, which lies in the Luapula (Upper Congo) watershed; (3) to record data concerning the distribution of fishes over the Luapula–Zambezi watershed, with a view to subsequent work on the distribution of the African freshwater fauna in relation to physiography and geological history.

Capt. Pitman's collection is an important one, not so much for the number of new species it contains, of which three, belonging to the genera *Nannocharax*, *Barbus*, and *Clarias*, are described in this paper, but for the many new records affecting the distribution of known species. Part of the collection was made from various localities in the Loangwa Valley, which drains in a south-westerly direction into the Zambezi, but most of the fishes are from the drainage basin of Lake Bangweulu. This lake and the vast swamp which adjoins it receive water from several rivers, the most important of which is the Chambezi, generally regarded as the ultimate source of the Congo. Lake Bangweulu is drained from its south end by the Luapula River, which flows due south, receiving several minor tributaries, swings round to the west and then to the north, soon to precipitate itself over the Mumbatuta (or Mambirima) Falls, which are situated in 12° 17′ S. and 29° 15′ E. It seems that this waterfall acts as a partial barrier to the distribution of aquatic fauna, and divides the fauna of the lower parts of the Luapula and Lake Mweru from that of the Bangweulu region. In this paper "Bangweulu region" denotes all the drainage basin of the Luapula above the Mumbatuta Falls.

The fishes of Lake Bangweulu itself have been collected by Mr. F. H. Melland, and as a result of his first collection, made in co-operation with Father Foulon in 1904, Boulenger (1905) published a list of Bangweulu fishes. Additional material, collected later by Melland, has added several more records, most of which are mentioned by Boulenger (1909–16). Pitman's collection from the Chambezi River and from several tributaries of the Luapula which enter the main river near the Bangweulu swamp, or enter the swamp itself, has added twelve more species. As a result Boulenger's (1905) list is now more than doubled, and the time seems ripe for the publication of a new list of fishes from the Bangweulu region. This will afford material for the study of distribution and may also be of use to field-workers.

I have pointed out recently (1933) that many species of fish, especially those which frequent swampy rather than open-water environments, have a distribution extended over the Luapula–Zambezi watershed. In many places the watershed is low-lying, and during the wet seasons connection between one drainage basin and the other is provided by swamps. In that paper I stressed the importance of studying the faunas of such swampy watersheds, which exist also in other parts of Africa, since they may throw much light on the evolution of the aquatic fauna of the continent as a whole. Pitman's collection has brought out the similarity of the Upper Congo and Zambesi faunas very strongly, and the following Table of Species has been designed to show this by indicating the distribution of the Bangweulu fishes in the Congo system (other than the Bangweulu region), the Zambezi system, and elsewhere. The table (p. 36) shows

	Bangweulu region.	Congo system.	Zambezi system.	Elsewhere.
MORMYRIDÆ.				
Petrocephalus simus	P *	P	..	Niger, Chad, Ogowe.
Marcusenius discorhynchus	P	P	P	
Gnathonemus monteiri	P	P		
Gnathonemus macrolepidotus	P	..	P	L. Ngami.
Mormyrus longirostris	P	P	P	
CHARACINIDÆ.				
Hydrocyon lineatus	P	P	P	Nile, Niger, Limpopo, etc.
Alestes macrophthalmus	P	P	..	Gaboon.
Alestes imberi	P	P	P	Rovuma, Limpopo, etc.
Alestes grandisquamis	P	P		
CITHARINIDÆ.				
Distichodus maculatus	P	P		
Nannocharax minutus	E *			
CYPRINIDÆ.				
Labeo altivelis	P	P	P	
Labeo congoro	P	P	P	
Barbus trimaculatus	P *	P	P	Transvaal, Zululand.
Barbus paludinosus	P *	P	P	E. and S. Africa from Abyssinia to Angola, Orange R., Natal.
Barbus eutænia	P *	P	P	Angola, Transvaal.
Barbus banguelensis	P	P	P	
Barbus unitæniatus	P *	P	..	Angola, Transvaal, Zululand, Natal.
Barbus brevidorsalis	P *	P		
Barbus multilineatus	E *			
CLARIIDÆ.				
Clarias gariepinus	P	P	P	Angola, S. Africa.
Clarias mossambicus	P	P	P	E. Africa, L. Victoria, etc.
Clarias mellandi	P	..	P	
Clarias stappersii	P *	P		
Clarias theodoræ	P	P	P	L. Ngami, Natal, Zululand.
SCHILBEIDÆ.				
Eutropius banguelensis	P	P		
Schilbe mystus	P	P	..	Nile and tropical Africa.
BAGRIDÆ.				
Chrysichthys mabusi	P	P		
Auchenoglanis occidentalis	P	P	..	Nile, Chad, Niger, etc.
MOCHOCHIDÆ.				
Synodontis nigromaculatus	E			
Synodontis melanostictus	P	P	P	
CYPRINODONTIDÆ.				
Haplochilichthys moeruensis	P *	P		
Haplochilichthys katangæ	P *	P		
ANABANTIDÆ.				
Ctenopoma multispinis	P	P	P	Bechuanaland.
Ctenopoma ctenotis	P *	P	P	
MASTACEMBELIDÆ.				
Mastacembelus signatus	E			
Mastacembelus mellandi	E			

P = Present, but not endemic.
E = Endemic to the Bangweulu region.
* = Not previously recorded from the Bangweulu region.

[Lake Tanganyika is included with the Congo system.]

that thirty-seven species are recorded from the Bangweulu region : sixteen of these are found both in the Congo and Zambezi systems, fourteen are found only in the Congo, two only in the Zambezi, and five are endemic to the Bangweulu region.

It need hardly be mentioned that our knowledge of the fishes of this part of Africa is not yet complete. There are vast areas of swamp and an intricate network of streams and rivers which have not been collected at all, and there is no doubt that many kinds of fish, particularly the smaller species of Cyprinidæ and Cyprinodontidæ, await discovery ; whereas practically nothing is known of the ecology, even of the larger species, which are of economic importance.

Although this paper is devoted chiefly to the Bangweulu region, Pitman's collection from the Loangwa R. (Zambezi system) is also considered, so that certain species which are included in the body of the paper do not appear in the table.

The native names are from Pitman's labels or from Boulenger's paper (1905), for which the names were supplied by Father Foulon. In cases where Foulon's name differs from Pitman's, the former has been placed in brackets.

I am indebted to Mr. J. R. Norman of the British Museum (Natural History) for granting me facilities in his department, and for reading the manuscript of this paper. Mr. Norman made provisional determinations of the first consignment of Pitman's collection, and thereby saved me much time in the initial stages of this work.

Mormyridæ.

Petrocephalus simus Sauvage.

Not previously recorded from the Bangweulu region, but known from the Upper Congo.

Pitman's collection contains fifteen specimens (35–60 mm. long) from Lukulu R., Luapula system, 3800 ft. These are typical, except that the dorsal rays number 21 to 23 instead of 24 to 28 and the base of the dorsal fin is often shorter than its distance from the caudal. In this character the Bangweulu specimens resemble *P. bovei* (Cuv. & Val.), a closely related species from the

Lower Nile, Senegal, and Gambia. It seems that the two species are scarcely separable, especially in the young

Native name : " Ishimbakaylay."

Marcusenius discorhynchus (Peters).

Three specimens from Lake Bangweulu in the B.M. (coll. Melland).

Not represented in Pitman's collection.

Gnathonemus monteiri (Günther).

Two specimens from Lake Bangweulu in the B.M. (coll. Melland).

Native name : " Lukesu."

Not represented in Pitman's collection.

Gnathonemus macrolepidotus (Peters).

In a previous paper (Worthington, 1933) I have discussed the distribution of this species, which is extended over the Zambezi–Luapula watershed. The specimens sent home by Pitman from both watersheds, mentioned below, bear out those remarks.

Eleven specimens (60–150 mm. long) from Lukulu R., Luapula system, 3800 ft.

One specimen (80 mm. long), label illegible, 3800 ft.

Many specimens (50–70 mm. long) from Changola, Luapula system, 3600 ft.

One specimen (100 mm. long) from Loangwa R., Zambezi system, 1300 ft.

Native name : " Mintosa " (" Mutesa ").

Mormyrus longirostris Peters.

Two specimens from Lake Bangweulu in the B.M. (coll. Melland).

Not represented in Capt. Pitman's collection.

Characinidæ.

Hydrocyon lineatus Bleeker.

Two specimens from Lake Bangweulu in the B.M. (coll. Melland).

Pitman's collection includes the following :—

One adult (290 mm. long) from Lukulu R., Luapula system, 3300 ft.

One adult (310 mm. long) from Chambesi R., Luapula system, 4500 ft.

Three half-grown (120–170 mm. long) from Loangwa Valley, Zambezi system, 1400 ft. These have rather a pale coloration and differ from Boulenger's description (1909–16) in that the dark lateral bands do not extend to the series of scales below the lateral line.

Native name : " Inchene."

Alestes macrophthalmus Günther.

Two specimens from Lake Bangweulu in the B.M. (coll. Melland).

Not represented in Pitman's collection.

Alestes imberi Peters.

One specimen from Lake Bangweulu in the B.M. (coll. Melland).

Not taken by Pitman from the Luapula system, but forty-three specimens (50–110 mm. long) were collected from the Loangwa River, Zambezi system, 1400 to 1750 ft.

Native names : " Chitanga " and " Intanga " (" Lusaku ").

Alestes grandisquamis Boulenger.

One specimen from Lake Bangweulu in the B.M. (coll. Melland).

Native name : " Mutula."

Not represented in Pitman's collection.

Citharinidæ.

Distichodus maculatus Boulenger.

Typically a Congo species, of which there is one specimen from Lake Bangweulu in the B.M. (coll. Melland).

Pitman collected five adults (210–220 mm. long) from the confluence of the Chambesi and Namipundu Rivers, Luapula system, 4500 ft. All of these specimens differ from the types and from Boulenger's description (1909–16) in having a deeper body, 2⅔ to 2⅘ instead of 3 to 3⅓ times in the length. In addition the interorbital width is slightly less and the spots on the sides of the body are very indistinct. In all other respects, however, these Chambesi specimens are identical with specimens from the Congo and Lake Bangweulu, and therefore I regard them as representing a race and not a distinct species.

Native name : " Kassay " (" Chikamalunski ").

Distichodus mossambicus Peters.

A species endemic to the Zambezi system, but closely related to *D. fasciolatus* Blgr., from the Congo. Previously represented in the B.M. by three specimens (skins) from the Shiré River (coll. Livingstone & Kirk) and one specimen from the Loangwa River, N.W. Rhodesia (coll. Neave).

Pitman's collection contains one half-grown specimen (320 mm. long) and two young (34 and 57 mm. long) from the Loangwa River, 1350 ft. These are typical, except that there are 9 to 11, instead of 6 or 7, indistinct dark bars on the body ; the eye in the young specimens, as might be expected, is proportionately larger. In addition, there is one young specimen (69 mm. long) from the same locality which differs in having a longer head, 3⅓ instead of 3½ to 4½ times in length of body, 2½ instead of 2 to 2⅓ times as long as broad, and, correspondingly, the interorbital width is 3¼ instead of 2½ to 3 times in length of head. In other respects this specimen is identical with *D. mossambicus*, so I would not separate it as a distinct species until adults showing similar characters are discovered.

Native names : " Lukwetee " and " Ijenga."

Nannocharax minutus, sp. n.

Depth of body 4 to 4⅕ times in length, length of head 3½ to 3⅗ times. Head considerably deeper than broad ; snout as long as or a little shorter than eye, which is 3 to 3¼ times in length of head and is a little longer than interorbital width. Dorsal III 10–11, originating just in front of base of pelvics, situated at equal distances from centre of eye and root of caudal, longest ray about ¾ length of head. Anal III 7–8. Pectoral about ⅔ length of head, not nearly reaching root of pelvic. Caudal forked, with pointed lobes. Caudal peduncle 1⅓ to 1½ times as long as deep. Scales 38–40 $\frac{5\frac{1}{2}}{6\frac{1}{2}}$, 4 between lateral line and ventral. Pale straw-colour above, white beneath; hinder ⅓ to ⅔ of body barred vertically with dark markings; a dark stripe along the lateral line, terminating in a black ocellus, set in a white triangle, at the base of the tail.

Ten specimens (26–28 mm. long) from a swamp near the River Luombo, Luapula system, 3900 ft. (types).

This new species is nearly related to *N. ansorgii* Blgr. (1909–16), a W. African species, from which it differs structurally in having rather larger scales, and can be distinguished at a glance by the dark markings. *N. ocellicauda* Blgr. (1909–16), another W. African species, has a similar black ocellus at the base of the tail, but has much smaller scales. *N. luapulæ* Blgr. (1915) is another nearly related species from the Luapula system below the Mumbatuta Falls; it is characterized by having smaller scales and fewer dorsal and anal fin-rays. *N. multifasciatus* Blgr. (1923), described from a single specimen from Sesheke, Zambezi system (type in South African Museum), differs from *N. minutus* in having a longer and thinner body, shorter head, and fewer dorsal and anal rays.

It is evident from the above considerations that there is, in the part of Africa under consideration, a series of closely related species of these tiny fishes. From the fact that very few specimens of *Nannocharax* from this region are yet known, and that those from each locality differ sufficiently to be described as distinct species, it is evident that there are many more species awaiting discovery, or, alternatively, exhaustive collecting may show that there are in reality few species with many distinct geographical races.

Cyprinidæ.

Labeo altivelis Peters.

Four specimens from Lake Bangweulu in the B.M. (coll. Melland).

This species is well represented in Pitman's collection:—

Four adults (200–235 mm. long) from the confluence of the Chambesi and Namipundu Rivers, Luapula system, 4500 ft.

Twenty-nine young, half-grown, and small adults (53–155 mm. long) from Loangwa R., Zambezi system, 1350–1400 ft.

Native names: "Inanga," "Irumbu," "Lupumbu" ("Pumbu").

These specimens are all fairly typical except that in most the dorsal fin has a slightly concave instead of convex edge as in Boulenger's description and figure (1909–16). The large series of young and half-grown specimens from the Loangwa River bring out the interesting fact that in this species, which is characterized, as its name implies, by a particularly large dorsal fin, the heterogonic ratio of length of dorsal fin to length of head is reversed. In most fishes the proportionate length of the fin-rays is larger in the young and decreases as the fish increases in size. This is particularly marked in those fishes which have the anterior dorsal rays modified into spines, which doubtless serve as a protection to the fishes during their young stages. Measurements on this new series of *Labeo altivelis* show, however, that in this species the dorsal fin is proportionately shorter in the young and increases markedly as the fish attains maturity. Thus in specimens of 50–60 mm. length the longest dorsal rays are about 1¼ times as long as head; in specimens of 100 mm. length the dorsal rays are about 1½ times as long as head; specimens 120 mm. long 1¾ times; 140 mm. long twice; and a specimen of 155 mm. long has the dorsal rays 2⅓ times as long as head.

Labeo congoro Peters.

This species, which was originally described from specimens from the Zambezi River (types in Berlin Museum), was previously represented in the B.M. collection by a single specimen from L. Mweru (coll. Stappers).

In Pitman's collection there are six young and half-grown specimens (58–122 mm. long) from the Loangwa R., Zambezi system. These were collected together with *Labeo altivelis*, which they resemble in general proportions, but from which they can be distinguished easily by the lips, having their inner surfaces covered with numerous very small transverse plicæ instead of bearing rather large unfused papillæ. The colour of *L. congoro* is considerably darker than that of *L. altivelis*.

Barbus trimaculatus Peters.

Not previously recorded from the Bangweulu region, but known from the Kafubo R., Lualaba system (coll. Stappers) (see Boulenger, 1920 *b*).

Pitman's collection includes the following specimens :—

Twenty-three specimens (70–90 mm. long) from Lukulu R., Luapula system, 3800 ft.

Two specimens (105 and 112 mm. long) from near Lake Bangweulu, Luapula system.

In addition eighteen very young specimens (20–40 mm. long) were collected from the Loangwa R., Zambezi system, 1800 ft.

Native names : " Musenga " or " Misenga " (" Busonga "), which are applied indiscriminately to all the small species of *Barbus*.

Barbus paludinosus Peters.

This is typically an East and South African species, but has been collected from the Upper Lualaba by Stappers. It was not previously known from the Bangweulu region.

Capt. Pitman's collection comprises the following :—

Thirty-nine specimens (45–70 mm. long) from Luombwa R., Luapula system, 3800 ft.

Fifty-two specimens (25–75 mm. long) from Loangwa Valley, Zambezi system, 1300–1800 ft.

Barbus eutænia Boulenger.

Previously recorded from the Zambezi system, but not from any part of the Congo.

A single specimen (41 mm. long) collected by Pitman from near Lake Bangweulu, Luapula system, is referable to this species. It differs from the types, however, in having 8 instead of 7 branched rays in the dorsal fin.

Barbus banguelensis Boulenger.

This species was known only from Lake Bangweulu (a single type-specimen, coll. Melland), and from the Kafubo R., Upper Lualaba, until I showed (1933) that specimens from Lake Nyasa must be referred to it, and therefore that this species also has a distribution extended over the Luapula–Zambezi watershed. Pitman's collection confirms this conclusion, since it contains specimens from the Loangwa Valley as well as from the Luapula system.

Twenty young specimens (28–33 mm. long) from swamps near the Luombwa R., Luapula system, 3800 and 3900 ft. These were described by the collector as being mauve, with flame-coloured tails, but no trace of this has persisted in spirit.

Three adults (43–70 mm. long) from two localities in the Loangwa Valley, Zambezi system, 1400 and 1750 ft.

Barbus unitæniatus Günther.

A South African and Angolan species, which had also been recorded from Katanga in the basin of the Upper Lualaba.

Pitman's collection contains :—

Twenty-nine specimens (30–41 mm. long) from swamps near the Luombwa R., Luapula system, 3900 ft.

Three specimens (32–47 mm. long) from Chinsali, Luapula system, 4700 ft.

These specimens differ from Boulenger's description (1909–16) in having 29 or 30 instead of 30 to 33 scales in the lateral line.

Barbus brevidorsalis Boulenger.

A species described from specimens collected from the Lukinda R., Congo system, by Dr. Stappers. Not represented previously in the B.M.

Pitman's collection contains thirty specimens (25–27 mm. long) from swamps near Luombo R., Luapula system. All of these agree well with Boulenger's description, which was based on the examination of only two specimens, except for the fact that these specimens from the Bangweulu region have 7 instead of 6 branched rays in the dorsal.

Barbus multilineatus, sp. n.

Depth of body 3 to 3½ times in length, length of head 3⅘ to 4 times. Snout rounded, not so long as eye, which is 2¾ to 3 times in length of head ; interorbital width 2¼ to 2½ times in length of head ; mouth terminal, its width about 3½ times in length of head; barbels two on each side, posterior longer than anterior and slightly longer than eye. Dorsal III 8, a little nearer root of caudal than eye, border straight; last simple ray bony, strongly serrated behind, its bony part ¾ to once length of head. Anal III 5, not reaching caudal. Pectoral shorter than head, not reaching pelvic, the base of which is nearly entirely in advance of dorsal. Caudal peduncle 1½ to 1¾ times as long as deep. Scales 25 $\frac{4\frac{1}{2}}{3\frac{1}{2}-4\frac{1}{2}}$, 2 between lateral line and base of pelvic, 10 to 12 round caudal peduncle. Lateral line tubercles extending only to the anterior 6 scales. Yellow above, silvery beneath; a distinct straight black median band extending from tip of snout, through the eye, to the caudal fin; 3 subsidiary blackish bands, corresponding each to a series of scales, above the median band, and 2 or 3 similar but less distinct bands below.

Eighteen specimens (24–27 mm. long) from a swamp near River Luombo, Luapula system, 3900 ft. (types).

This species seems most nearly related to *B. eutænia* Blgr. It belongs to the group with serrated dorsal spine and two barbels, but is quite distinct from all previously known species of this group in having an incomplete lateral line. This character is so distinctive that I have described this new species from specimens which are probably immature. There should be no difficulty in recognizing the adults when they are discovered.

Clariidæ.

Clarias gariepinus (Burchell).

Two specimens from Lake Bangweulu in the B.M. (coll. Melland).

Pitman's collection includes the following specimens from the Luapula system:—

One adult (370 mm. long) from Chambezi–Namipundu confluence, 4500 ft.

Two small adults (290 and 300 mm. long) from Lukulu R., 3800 ft.

Five young (70–118 mm. long) from Luombwa R., 3800 ft. (probably referable to this species).

Native name: “ Meeta ” or “ Moota.”

Clarias mossambicus Peters.

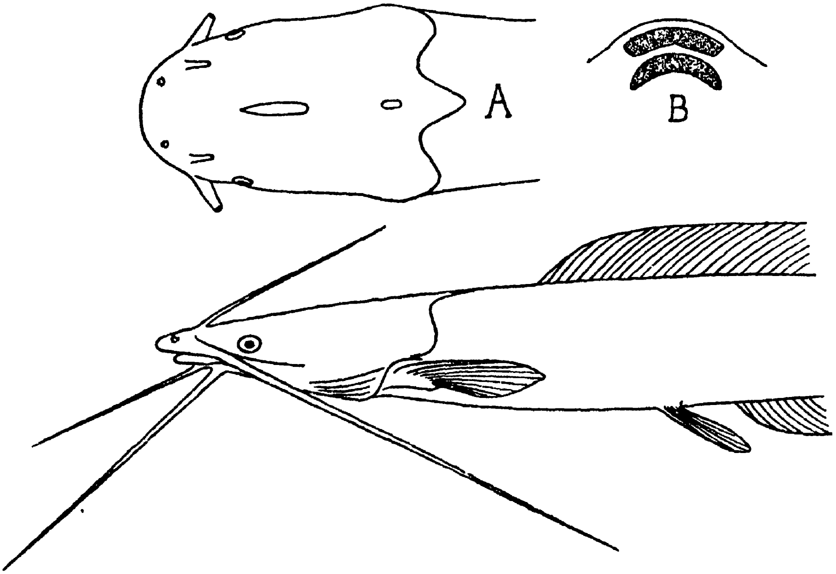
One specimen from Lake Bangweulu in the B.M. (coll. Melland).

Pitman's collection includes the following :—

One half-grown (245 mm. long) from Luombwa R., Luapula system, 3800 ft.

Twenty young, half-grown, and adult (80–420 mm. long) from Loangwa Valley, Zambezi system, 1300 to 1600 ft.

Native name : " Kapunta."



Clarias loangwensis, sp. n. × ⅓.
A. Dorsal view of head.
B. Ventral view of premaxillary and vomerine teeth.

Clarias loangwensis, sp. n.

Depth of body 6¼ times in length, length of head 2⅘ times. Head 1½ times as long as broad, granulate above ; occipital process acutely pointed ; frontal fontanelle knife-shaped, not quite ¼ length of head ; occipital fontanelle smaller, in advance of occipital process ; eye small, 4 times in length of snout, 7 times in interorbital width, which equals width of mouth and is not quite ½ length of head ; band of premaxillary teeth 5 times as long as broad ; vomerine teeth conical, forming a crescentic band which is as broad as the premaxillary band; nasal barbel $\frac{2}{3}$ length of head; maxillary barbel $1\frac{2}{5}$ times as long as head, extending well beyond extremity of pectoral fin; outer mandibular barbel almost as long as head, inner $\frac{3}{5}$ (absent on one side). Gill-rakers few, wide apart and rather short, 22 on anterior arch. Clavicles hidden under the skin. Dorsal about 62 (damaged in the type-specimen, so that it presents the appearance of a divided dorsal fin), its distance from occipital process $\frac{1}{5}$ length of head, its distance from caudal (?). Anal 44, narrowly separated from caudal. Pectoral not quite $\frac{1}{2}$ length of head, the spine feebly serrated on its outer border and $\frac{5}{7}$ length of the fin. Pelvic nearer caudal than end of snout (damage to hind end of body partly accounts for this). Caudal $\frac{1}{2}$ length of head. Brown above, pale beneath.

A single specimen (holotype), 300 mm. long, from R. Loangwa, Zambezi system, 1350 ft. (coll. Pitman).

Native name: "Sampa."

In spite of the damaged and partly regenerated condition of the caudal region of the body I have no hesitation in describing this unique specimen as a new species. The remarkably long barbels and the few gill-rakers place it nearest to *C. platycephalus* Blgr. from the Upper Congo and South Camaroon, but the new species differs in having 22 instead of 12 gill-rakers (specimens of about the same size), and in having a much longer and narrower head with acute instead of obtuse occipital process. In the shape of the head and the length of the barbels the new species resembles *C. nyasensis* Worthington (1933) from Lake Nyasa, a species which is quite distinct, however, in having very numerous long gill-rakers, 118–220 on anterior arch.

Clarias mellandi Boulenger.

This very distinct species was known previously from two specimens (types) from Lake Bangweulu in the B.M. (coll. Melland) and eight specimens from Lake Nyasa (coll. Christy).

Pitman's collection includes two examples:—

Adult (355 mm. long) from Chambezi–Namipundu confluence, Luapula system, 4500 ft.

Young (125 mm. long) from Luombwa R., Luapula system, 3800 ft.

Native name : " Moota " (" Muta " or " Mulenga ").

Clarias stappersii Boulenger.

This species was described from a single specimen (245 mm. long) from an affluent of the Lukinda River (coll. Stappers). No other specimens were known until Pitman collected two, which I assign to this species in spite of minor differences :—

Adult (245 mm. long) from Lukula R., Luapula system, 3800 ft.

Half-grown (178 mm. long) from Chinsali, Luapula system, 4700 ft.

Native name : " Mbombo."

These two specimens differ from Boulenger's description of *C. stappersii* (1915) in the following particulars :—

Depth of body 6½ to 6¾ times in length, instead of 6 times. Maxillary barbel ½ to ⅗ length of head, instead of a little less than ½. 9 gill-rakers on anterior arch, instead of 10. 78 to 80 dorsal rays, instead of 71. 55 to 57 anal rays, instead of 47. Distance between dorsal and caudal equal to or a little less than diameter of eye, instead of a little greater than eye.

Of these characters the more numerous dorsal and anal fin-rays seem to afford characters almost sufficiently marked to separate Pitman's specimens as a new species, but in view of the fact that in nearly all other characters these specimens are identical with Boulenger's type of *C. stappersii*, and that most well-known species of *Clarias* exhibit considerable variation in the number of fin-rays, I hesitate to describe a new species until more material is available for study.

Clarias theodoræ Weber.

Clarias fouloni Boulenger, 1905.

I have already shown (1933) that Boulenger's *C. fouloni*, originally described from Bangweulu specimens, is inseparable from Weber's *C. theodoræ*, known from the Zambezi system and South Africa. This conclusion was reached after studying Christy's Lake Nyasa collection and a part of Pitman's recent collection. Subsequently a second consignment from Pitman was found to contain other specimens which confirmed this "lumping" of the two species. Pitman's specimens are as follows :—

Seven adults (140–200 mm. long) from Chambezi–Namipundu confluence, Luapula system, 4500 ft.

Three young and half-grown (60–110 mm. long) from Chinsali, Luapula system, 4700 ft.

Eight young and half-grown (82–110 mm. long) from Luombwa R., Luapula system, 3800 ft.

Native name : "Mulenfi."

Schilbeidæ.

Eutropius banguelensis Boulenger.

Known only from a single adult from Lake Bangweulu, in the B.M. (coll. Melland). Not represented in Pitman's collection.

Eutropius depressirostris Peters.

Not a Bangweulu fish, but previously known from the Zambezi, East and South-East Africa. Pitman collected the following :—

Twenty specimens (60–112 mm. long) from Loangwa Valley, Zambezi system, 1300 to 1500 ft.

Native name : "Lupata."

Schilbe mystus Linnæus.

One specimen from Lake Bangweulu in the B.M. (coll. Melland).

Pitman's collection contains the following :—

One adult (250 mm. long) from Luombwa R., Luapula system, 3800 ft.

One adult (245 mm. long) from Chambezi–Namipundu confluence, Luapula system, 4500 ft.

Fourteen young (65–80 mm. long) from Lukulu R., Luapula system, 3800 ft.

Native name : "Lupata."

Bagridæ.

Chrysichthys mabusi Boulenger.

Known only from one specimen from Lake Bangweulu in the B.M. (coll. Melland). Not represented in Pitman's collection.

Native name : "Mabusi."

Auchenoglanis occidentalis (Cuvier & Valencinnes).

One specimen from Lake Bangweulu in the B.M. (coll. Melland). Not represented in Pitman's collection.

Native name : " Bowa."

Mochochidæ.

Synodontis nigromaculatus Boulenger.

Known only from a single type-specimen from Lake Bangweulu, in the B.M. (coll. Melland). Not represented in Pitman's collection.

Native name : " Chirima."

Synodontis melanostictus Boulenger.

This is another of those species which has a distribution extended over the Congo–Zambezi divide. There is one specimen in the B.M. from Lake Bangweulu (coll. Melland). Not represented in Pitman's collection.

Malopteruridæ.

Malopterurus electricus Lacepède.

Not yet recorded from Lake Bangweulu, but known from both the Congo and Zambezi systems. Pitman collected one specimen (140 mm. long) from the Loangwa Valley, Zambezi system, 1400 ft.

Cyprinodontidæ.

So far as I am aware, no species of this family have been recorded previously from the Upper Luapula system (above the Mumbatuta Falls). Pitman collected two species from these waters, both members of the genus *Haplochilichthys*. I have identified these as *H. moeruensis* (Boulenger) and *H. katangæ* (Boulenger), but Pitman's specimens differ from the types in one or two minor particulars, which are mentioned below.

Haplochilichthys moeruensis (Boulenger).

A species previously known only from Lake Mweru (coll. Stappers).

Pitman's collection contains three specimens (21–25 mm. long) from a swamp near R. Luombo, Luapula system, 3900 ft. All of these differ from the types and from Boulenger's description in the following particulars :—

Head nearly 4 times in length of body, instead of 3½ to 3⅔ times ; eye 2¾ times in length of head, instead of 2½ to 2⅔ times. Anal 13 or 14, instead of 14–16.

Haplochilichthys katangæ (Boulenger).

Previously known only from the Upper Lualaba tributaries, and represented in the British Museum (Natural History) by two very small specimens (types) from the Lubumbashi R., near Elizabethville (coll. M. Pope), and eight very small specimens from Elizabethville (coll. Stappers).

Pitman's collection contains seven specimens (26–32 mm. long) from Chinsali, Luapula system, 4700 ft. These are much larger than the previously known specimens from the Lualaba, and differ in the following particulars :—

Eye 1⅓ to 1½ times in interorbital width, instead of a little more than once. Origin of dorsal 1⅔ to 1¾ times as distant from eye as from root of caudal, instead of 1½ to 1⅔. Longest rays of dorsal ¾ to once length of head, instead of ⅔ to ¾. No dark streak along lower half of body. With regard to these characters the greater interorbital width and longer dorsal rays in Pitman's specimens from the Bangweulu region can be attributed to the fact that Boulenger's description (1909–16) was based on very small immature fish. The other characters are not sufficient to separate Pitman's specimens as distinct from *H. katangæ*.

Anabantidæ.

Ctenopoma multispinis Peters.

Four specimens from Lake Bangweulu in the B.M. (coll. Melland).

Pitman's collection includes thirty-three examples (50–105 mm. long) from Luombwa R., Luapula system, 3600–3800 ft.

Native name : " Inkoma " (" Lukomo ").

Ctenopoma ctenotis (Boulenger).

Described originally (1920 *a*) from two specimens from near the west shore of Lake Tanganyika, Congo watershed. I have referred a single specimen from Lake Nyasa, collected by Dr. Christy, to the same species (Worthington, 1933), in which publication Pitman's specimens were mentioned also :—

Three specimens (33–42 mm. long) collected with the last species from Luombwa R., Luapula system, 3600–3800 ft.

This species is very nearly related to *C. nanum* Günther, from the Congo, and further material may show it to merit varietal rather than specific rank.

Mastacembelidæ.

Mastacembelus signatus Boulenger.

One specimen (type) from Lake Bangweulu in the B.M. (coll. Melland). Not represented in Pitman's collection.

Mastacembelus mellandi Boulenger.

One specimen from Solwezi R., Luapula system, near the Zambezi watershed, in the B.M. (coll. Melland). Not represented in Pitman's collection.

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IV.—*Description of a new Species of Crab of the Genus* Clistocœloma *from China.* By CHIA-JUI SHEN, B.S., Research Fellow of the China Foundation for the Promotion of Education and Culture, Peiping.

THE species of the genus *Clistocœloma* so far known are endemic to Asiatic waters, especially the Indo-Pacific region. A. Milne-Edwards established this genus for the species *Cl. balansæ* * from New Caledonia in 1873.

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* Milne-Edwards, A., Nouv. Arch. du Mus. vol. ix. p. 311, pl. xvii. fig. 1, 1873 (type ♂).

J. G. de Man added another species, *Cl. merguiense*[*], from Kisseraing Island (Mergui Archipelago) in 1888, and M. J. Rathbun described a third species from Port San Vicente, near Luzon, Philippine Islands, as *Sesarma (Sesarma) tectum*[†], in 1914. This latter species was correctly transferred from the genus *Sesarma* to *Clistocœloma* by J. J. Tesch[‡] in his invaluable work published in 1917. Since then no further record has been made for this genus. Last summer, a small collection of Brachyura collected from Ningpoo, Chekiang, China, by the Biological Laboratory of the Science Society of China, Nanking, was given to the present author for identification. This collection included a new species of this rare genus, extending the distribution to the coast of China.

The new species is very different from any of the other three species on record, and it may be inserted in Tesch's key. The chief differences distinguishing the species are shown in that author's artificial key given below in modified form.

Key to Species of the Genus Clistocœloma.

I. Distance between external orbital angles distinctly more than length of carapace in the median line.
  a. External post-frontal lobes not subdivided by a short longitudinal groove. Last segment of abdomen of male twice as long as the preceding segment. Pectinated crest of manus of male cheliped consisting of twenty-five teeth. Movable finger bearing fifteen to sixteen granules on the dorsal surface .... *merguiense* de Man.
  aa. External post-frontal lobes subdivided by a short longitudinal groove. Last segment of abdomen of male one and a half times as long as the preceding segment. Pectinated crest of manus of male cheliped consisting of thirty to forty teeth. Movable finger bearing eleven to twelve granules on the dorsal surface .... *sinense* Shen.

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[*] de Man, J. G., Journ. Linn. Soc., Zool. vol. xxii. p. 195, pl. xiii. fig. 10, 1888 (type ♀); Zool. Jahrb. Syst. Bd. ix. pp. 339–343, 1896; Bd. x. pl. xxxi. fig. 40, 1898 (1 ♂ from Penang).

[†] Rathbun, M. J., Proc. U.S. Nat. Mus. vol. xlvii. p. 78, 1914 (type ♀).

[‡] Tesch, J. J., Zool. Med. Leyd. Mus. vol. iii. pp. 222–227, 259–260 (key), 1917.

II. Distance between external orbital angles about equal to length of carapace in the median line.

a. External post-frontal lobes subdivided anteriorly by a very short longitudinal groove into two lobes. Superior orbital border convex in its inner part. Fifth segment of abdomen of male longer than sixth segment; terminal segment twice as long as the preceding segment, posterior margin of the latter nearly three times the length of this segment. *balansæ* A. M.-Edwards.

aa. External post-frontal lobes subdivided anteriorly by a very short longitudinal groove into two lobes. Superior orbital border regularly concave in its inner part. Surface of carapace with regularly distributed large tufted tubercles. Fifth segment of abdomen of male as long as sixth segment; terminal segment only slightly longer than the preceding segment, posterior margin of the latter two and a half times the length of this segment .... *tectum* (Rathbun).

Family **Grapsidæ** Dana.

Subfamily *SESARMINÆ* Alcock.

Genus CLISTOCŒLOMA A. Milne-Edwards.

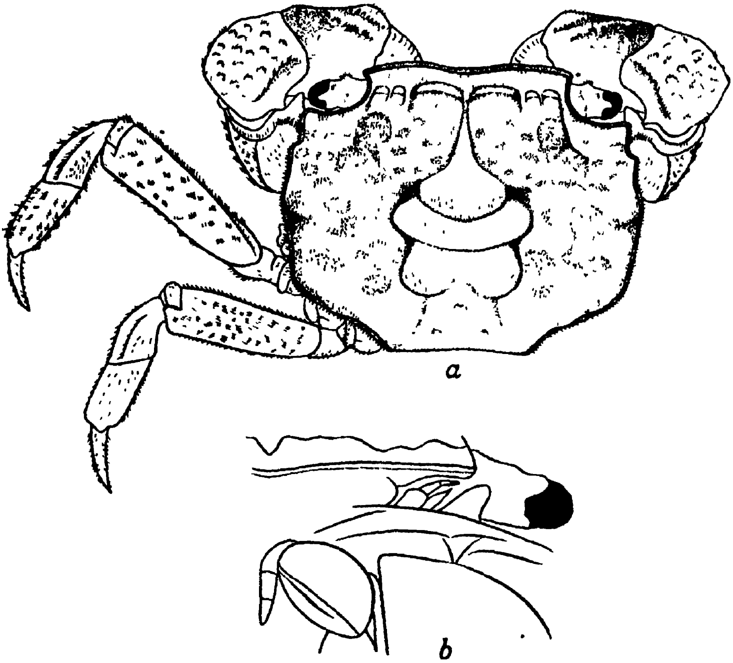
Clistocœloma sinense, sp. n. (Text-figs. 1–3.)

Description.—(1) *Type.* Body and appendages, except tips of dactyli of ambulatory legs and fingers of chelæ, covered everywhere with a dark dense tomentum, amid which are numerous clusters of dark brown short hairs, especially close on the lobulations, granules, and margins of carapace and appendages.

Carapace distinctly broader than long. Surface slightly convex, smooth and shining when denuded. Regions well defined by wide grooves and boldly and symmetrically lobulated. Post-frontal lobes with median pair very prominent, separated by a deep furrow leading posteriorly to gastric region; lateral pair much smaller than the former, subdivided by a shallow longitudinal groove into two tubercles, of which the outer one is larger than the inner. Behind these two tubercles there is a prominent hepatic tubercle. Protogastric, mesogastric, and metagastric regions highly elevated. Cardiac region with two tubercles placed side by side. Intestinal region with three small distinct tubercles, one anteriorly, two posteriorly. Epibranchial region with several small tubercles. Mesobranchial region with two larger ones. Metabranchial region with three prominent ones.

Front much more than half the breadth of carapace, obliquely deflexed; surface concave, margin slightly sinuous at middle and slightly produced on either side, turned up to form a rim which gradually decreases in height laterally.

Fig. 1.



Clistocœloma sinense, sp. n., ♂ (type).
a, dorsal view; *b*, facial view. *a*, × 2·2; *b*, × 4·5.

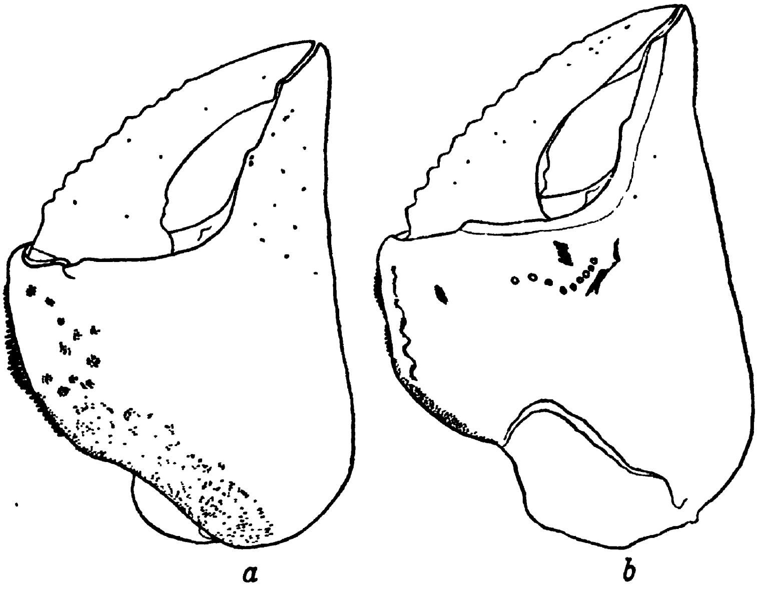
Orbit high, dorsal orbital margin strongly concave and rimmed. Ventral inner orbital lobe large, apex rounded, slightly apart from the antero-lateral corner of front.

Lateral margins of carapace thick, slightly divergent posteriorly, each cut into three lobes including the outer orbital angle, which has its lateral margin slightly convex.

Second lobe somewhat quadrate, separated from the anterior one by a deeper incision than from the posterior one. Third lobe very obtuse, with lateral margin longer than any of the anterior ones, and slightly convex where the carapace attains the greatest breadth.

Chelipeds similar in shape and size, much shorter than the second ambulatory leg. Distal portion of outer surface of manus and fingers naked. Merus with margins sharp, dorsal margin strongly arched in its distal portion, subdistal tooth rectangular ; ventral inner margin bearing about six denticles, unequally separated ; outer surface uneven, especially on dorsal distal portion. Carpus with a number of large and small tubercles on dorsal surface ; inner distal margin scarcely denticulate ; inner angle not produced. Manus higher than long, dorsal surface traversed longitudinally by a fine pectinated crest consisting of about thirty-four horny-coloured and comb-like teeth, of which the middle ones are the largest, and decreasing in size towards both ends. Proximally

Fig. 2.

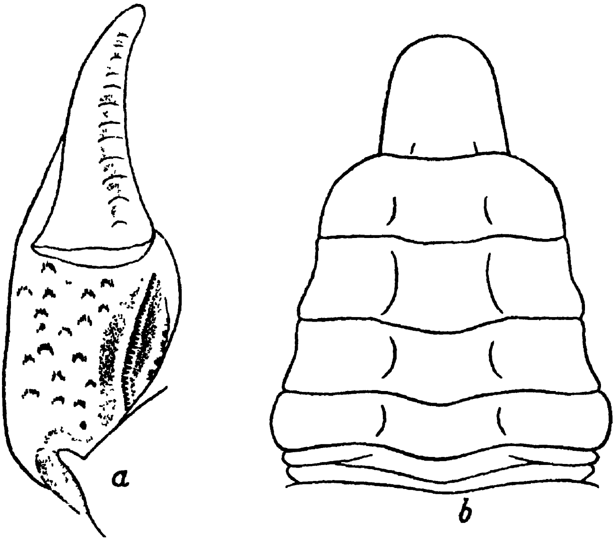


Clistocœloma sinense, sp. n., ♂ (type), *a*, outer view of right chela ; *b*, inner view of left chela: × 4·5.

the crest is replaced by a thickened hairy ridge curving downwards to the carpo-propodal articulation. The pectinated crest may be interrupted at the middle for some distance. On inner side of this pectinated crest is a line of four to five hairy granules, separated from the pectinated crest by a smooth groove. Outer surface punctate ; inner surface with a curved line of granules near distal margin, consisting of eight to nine granules.

Fingers punctate, subacute, tips slightly hollowed with horny margins. A wide gap between them when closed. Movable finger arched, longer than immovable and more than three times as long as the dorsal margin of manus ; dorsal surface distinctly traversed throughout its whole length by eleven to twelve tubercles, of which the proximal one is rounded off ; the middle ones are larger and transverse oval, their axes are not exactly perpendicular to the axis of the finger, but slightly oblique ; the distal ones are obtuse. Inner margin with two small tubercles near the proximal and a tooth at subdistal end. Immovable finger deeper than movable,

Fig. 3.



Clistocœloma sinense, sp. n., ♂ (type).
a, dorsal view of left chela ; *b*, abdomen. *a*, × 4·5 ; *b*, × 5.

ventral margin almost in a straight line with manus. Inner margin with a very small tubercle at proximal end, a larger one at middle, and a small tooth at subdistal, placed in front of that on movable finger when closed.

Third pair of ambulatory legs longest, about twice as long as carapace. Merus narrow, about four times as long as broad. Carpus very slightly longer than propodus as measured from their dorsal margins. Propodus slightly longer than dactylus as a rule. Dactylus of last leg slightly longer than propodus.

Fifth segment of abdomen slightly longer than sixth. Terminal segment one and a half times as long as sixth segment, posterior margin of the latter two and a half times the length of the segment.

(2) *Paratype.* The paratype is smaller than the type. It agrees with the above description except in a few minor points: (1) third antero-lateral lobe of carapace indistinct; (2) ventral inner orbital lobe nearly touching the antero-lateral corner of the front; (3) merus of cheliped bearing four denticles on ventral inner margin; (4) carpus denticulate on inner distal margin; (5) the pectinated crest of manus consists of thirty to forty horny teeth, the granulated line consists of seven to eight granules and that on inner surface consists of nine to ten granules; (6) each tubercle on dorsal surface of movable finger bears a median horny granule; (7) the lobulations on carapace are not as bold as those in the type.

Measurements.—

	♂ (type). mm.	♂ (paratype). mm.
Length of carapace	15	13
Breadth of carapace	18	15
Breadth of fronto-orbit	17	14
Breadth of front	10·6	8·6
Breadth of metagastric region	6·4	4·4
Length of cheliped	23·5	20·4
Length of manus of cheliped	5	4
Height of manus of cheliped	8	7
Length of dactylus of cheliped	8·7	7
Length of second ambulatory leg	29	..
Length of third ambulatory leg	..	23
Length of fifth segment of abdomen	2·3	2
Breadth of fifth segment of abdomen	5·8	5
Length of sixth segment of abdomen	2	1·7
Breadth of sixth segment of abdomen	5	4·6
Length of seventh segment of abdomen	3	2·6
Breadth of seventh segment of abdomen	2·7	2·3

Colour.—In alcohol, carapace yellowish, surface with some scattered dots of orange-red, and covered with clay-like tomentum and dark brown hairs. Chelæ and fingers ivory.

Type-locality.—Small Harbour, Ningpoo, Cheking China.

Habitat.—Muddy and stony shore, at low tidal mark.

Type.—1 ♂, paratype 1 ♂; coll. M. V. Chang and P. W. Fang, summer of 1931. Type in Zool. Mus. Fan Mem. Inst. Biol., Peiping; paratype in British Museum (Natural History), London.

Distribution.—China: Chekiang.

Acknowledgment.—The author's best thanks are due to Dr. Isabella Gordon for her valuable help in writing this paper, to Mr. W. E. Barnett for his assistance in the course of the work, and also to the British Museum (Natural History) for allowing him to use the library and laboratory facilities.

V.—*Variation in* Bombus jonellus *Kirby* (*Hymenoptera*, Bombidæ). By O. W. Richards, M.A.

The first author to show that *B. jonellus* varied geographically was Dr. O. Vogt (1911), who described a new race from Northern Europe, including Scotland. Most other authors have either not recorded variation or have included forms of the present species under *B. pratorum* L. The separation of these two species is, however, relatively easy, and only confusion can result from their amalgamation.

As is usual in this genus geographical variation is more strongly marked in the females than in the males. The latter sex has been dealt with so far as material was available. The differences in this sex are not, as a rule, completely discontinuous, but the mean of the colour-pattern is distinct.

1. *Bombus jonellus jonellus* Kirby (1802).

Female.—The hairs are black; some or most of those in the vertical tuft yellow; a moderately broad anterior thoracic collar, extending down to the anterior spiracle and half as wide as the black interalar band, the posterior half of the scutellum, tergite 1 (except sometimes a few hairs on the disc) with yellow hairs; a very narrow strip at base of disc of tergite 2 with yellow hairs; a narrow strip (rarely half as broad as the tergite) at the apex of tergite 3 and tergite 4–6 with white hairs; sternites 4–5 with whitish hairs; legs with black hairs, corbicular hairs pale reddish, rarely only pale-tipped or partly black; wings pale brown; hairs moderately long and even. Length 17·0 mm., breadth between the tegulæ 6·0 mm. (average of 30 specimens).

Male.—The hairs are black; those of the clypeus, of the vertical tuft, of the rather broad anterior thoracic collar extending to the sternum and two-thirds as wide as the interalar black band, of the scutellum almost entirely, and of tergite 1, yellow; tergite 2 with some yellow hairs intermixed at the sides basally; tergite 4 white- or black-haired; 5–7 white; sternites with whitish hairs; legs black-haired, corbicular hairs more or less reddish or red-tipped; wings hyaline; hairs moderately short and even. Length about 14 mm.

In about half the specimens tergite 4 is more or less black-haired and in about one quarter of them entirely black. Occasionally the meso-pleuron is mainly or entirely yellow-haired. Tergite 2 is rarely extensively yellow-haired and in nearly half the specimens is almost entirely black.

The above account is based on males from the S. of England.

Distribution.—England (including the Scilly Isles and Lundy Isle), Scotland (including Orkneys but not Hebrides), Ireland (one ♀ in the Brit. Mus. from Beoun Mt.); Belgium, France, Germany, Austria (except the Alps), probably Southern Scandinavia, and S. Russia (S. Ural, Vogt).

I have been able to examine only a very few continental examples, but these appear to agree with British specimens, and this is borne out by the descriptions of various authors, Three females from the Orkneys (2 ♀♀, Ronsay, 13–14 June, 1912, and 1 ♀, mainland, 15 June, 1912, Meade-Waldo, Brit. Mus. coll.) agree with the British form except that the scutellum is entirely yellow-haired; it would be interesting to examine a longer series from these islands.

Individual variation :—

Var. *obscuricauda* Ball (1914).

In this form the hairs of tergite 2 are yellow and those of the tail are black, except of the last tergite, which are white bordered with dark red. Described from one male ; Belgium.

Var. *proserpina* Friese & von Wagner (1909).

Black with a yellow-haired collar and the last abdominal tergite with dark red hairs. Described from one female ; Mecklenburg.

The two previous varieties might perhaps be regarded as melanic forms of *B. pratorum* L., but Ball gives good reasons for regarding at any rate var. *obscuricauda* as a *jonellus* form. The structural features of both these varieties require investigation.

In England the melanic tendency takes quite a different direction.

Var. *stygius*, nov.

Female.—Differs from the nominal form as follows :— Hairs of the vertex nearly always entirely black ; few or practically no yellow hairs in the anterior thoracic collar ; scutellum with black and yellow hairs mixed on the posterior half ; tergites 1 and 2 black-haired, rarely a few yellow hairs at the sides of tergite 1 ; corbicular hairs often rather darker.

Type, ♀, Oxshott, Surrey, 22 April, 1925 (Brit. Mus.). Paratypes (in my collection) : 1 ♀, Hindhead, Surrey, 2 April, 1926 ; 1 ♀, Oxshott, Surrey, 18 April, 1929 ; 1 ♀, 1 ☿, Knapp Hill, W. Sussex, 6 April, 1926 ; 1 ☿, Zennor, W. Cornwall, 6 Aug. 1924. A female more or less intermediate between the variety and the nominal form was captured at St. Mary's, Isles of Scilly, 20 July, 1925. In this specimen the thoracic collar is narrow and black mixed and tergite 1 has some black hairs on the disc.

Var. *flavicolor* Friese (1909).

Like the nominal form, but tergite 2 wholly yellow-haired. Recorded by Friese and Wagner (1909) from Germany, the Alps, and Sweden, but probably varieties of more than one race were confused. In the nominal form the variety appears to occur in the male only.

It has been recorded from Belgium by Ball (1914), and I have seen some British males from Fordoum, Kincardineshire (Waterston). A few males from Surrey nearly fall under this variety.

2. *Bombus jonellus vogtii*, subsp. n.

Bombus jonellus atrocorbiculosus Vogt (1911) in part., nec *Bombus ruderatus atrocorbiculosus* Vogt (1909); *B. nivalis* Smith (nec Dahlbom).

Many varietal names in humble-bees have been used three or four times for varieties of different species. I do not think this is a matter of much importance when only trivial colour-forms are involved, but the case is different with geographical races or subspecies, to which I hold the strict law of priority must be applied.

The present race differs from the nominal form as follows :—The thoracic collar is rather broader (as broad, or nearly, as the interalar black band) and is broader also laterally on the mesopleuron ; the scutellum is entirely yellow-haired ; tergite 2 has yellow hairs except for the apex laterally ; the white hairs of the tail very slightly yellow-tinged ; corbicular hairs black ; hairs scarcely longer than in *B. jonellus*. Size often rather larger, but variable.

Type, ♀, Lerwick, Shetland, 7 Sept. 1894 (Morice). Paratypes : 1 ♀, with the same data (tergite 3 almost entirely black-haired and the hairs of the tail quite deep yellow) ; 1 ♀, Unst, Shetland ; 2 ♀, Shetland ; 1 ♀, without locality data. All in the collection of the British Museum. 1 ♀, Shetland, Cambridge University Museum.

Male.—Differs from *B. j. jonellus* as follows :—The hairs of the mesopleuron are entirely yellow, thoracic collar broader ; of tergite 2 entirely yellow ; of tergite 4 entirely black ; pale hairs of tail distinctly yellow-tinged ; hairs of femora considerably yellow beneath ; corbicular hairs black except in one specimen. Five specimens from the Shetlands.

Vogt described his form *atrocorbiculosus* from the Amur district, Scotland, Orkney, Iceland, and Norway, but its occurrence in the mainland of Scotland and in Orkney requires confirmation ; the limits both of distribution and variation are as yet by no means clear. Apparently two or three races were confused by Vogt under one name.

3. *Bombus jonellus hebridensis* Wild (1931).

Differs from the nominal form as follows :—Hairs of the vertical tuft nearly all yellow ; anterior thoracic collar usually rather broader, one-half to three-quarters as broad as the interalar black band ; scutellum entirely yellow-haired ; basal half, sometimes rather more or less, of tergite 2 yellow-haired ; pale hairs of tail distinctly yellow-whitish-orange ; corbicular hairs mainly black with red tips ; hairs slightly longer. Size perhaps slightly larger.

This form was collected in the Hebrides by Dr. O. H. Wild, and owing to his kindness I have been able to examine five females and four workers from Lochboisdale, S. Uist, 14 July, 1930. Further 2 ♀, Lewis, July 1914, G. B. Hony, Cambridge University Museum. The race differs from subsp. *vogtii* in the reduced number of yellow hairs on the thorax and on tergite 2, the brighter yellow of the tail, and the red-tinged corbicular hairs. It is much to be desired that the humble-bee fauna of the Hebrides should be more fully explored.

4. *Bombus jonellus suecicus* Friese (1911).

? *Bombus jonellus atrocorbiculosus* Vogt (1911) in part.

Described by Friese from "Kalariam Tornea-Elf, N. Sweden." The females and workers are said to resemble *B. jonellus* except that they have no yellow hairs at the base of the abdomen. There is one female in the collection of the British Museum which belongs here. It has the following pattern :—The hairs are black, including nearly all those of the vertex ; collar rather narrow, three-quarters as broad as the interalar black band, entirely confined to the dorsal aspect of the mesonotum ; scutellum entirely yellow-haired ; tergites 1 and 2 black-haired ; tail white ; corbicular hairs black ; hairs about as long as in the nominal form. Length 17 mm., breadth at the tegulæ 6 mm.

Yow Kanga, Murman Coast, 5 Aug. 1917 (E. A. Cockayne) (Brit. Mus.).

I am provisionally treating this variety as a geographical race, in default of adequate material.

5. *Bombus jonellus subborealis*, subsp. n.

To this form belong all the Norwegian and Icelandic specimens of Vogt's *atrocorbiculosus*.

Female.—Like the nominal form, but with black corbicular hairs; hair-length and body-size about the same.

Type, ♀, Norway (Smith coll.) (B.M.). Paratypes: ♀, Salmis (Westerlund) (B.M.); ♀, at *Andromeda polyfolia*, midnight, Lofoten Islands, Svolvaer, 6–7 June, 1921, F. C. R. Jourdain (Oxford University Museum); 2 ♀ on *Vaccinium myrtillus*, noon, Lofoten Islands, behind Harstad, 0–300 ft., 7 June, 1921 (Oxford Univ. Mus.); ♀ on *V. myrtillus*, noon, birch-wood, mainland East of Tromsoe, 50–850 ft. (Oxford Univ. Mus.). The Oxford University Expedition to Lapland (1930) obtained numerous males and a few workers of this race. The workers resemble the females.

Male.—Differs from *B. j. jonellus* as follows:—Hairs of the mesopleuron mainly yellow in half the specimens; tergite 2 with basal half with yellow hairs in eight out of fourteen specimens; tergite 4 mainly black in thirteen specimens, entirely black in one; corbicular hairs less distinctly red-tinged. Twelve specimens from Tromsoe Prov., Norway (Oxford Univ. Mus.), 1 Lappland, and 1 Vadso (B.M.).

There are, further, two workers (one possibly a small ♀) in the British Museum collection from Iceland. One of these is a normal specimen of the race, the other has the pattern approximately normal, but the light hairs of the thorax and of the base of the abdomen are bright brown (as in *B. hypnorum* L.). I think that this unusual colour is probably due to the treatment that the specimen has received.

6. *Bombus jonellus martes* Gerstaecker (1869).

This form was described as a distinct species, and subsequently alternatively treated as a variety of *B. pratorum* or of *B. jonellus*. It is the form found at higher levels in the Alps and Germany (Bavaria); Scholz (1924) has also recorded it from Pless and Tarnowitz in Silesia.

A female from Innsbruck (5 April, 1895, Friese) in the collection of the British Museum differs from the nominal form as follows :—The scutellum is entirely yellow and tergite 2 black-haired ; tergite 3 and the basal half of tergite 4 are black-haired ; the corbicular hairs are black with the tips scarcely reddened. Length 18 mm., breadth between the tegulæ 6·5 mm.

The most usual form of this race is stated to have tergite 4 entirely black-haired.

Only two males of this subspecies were available for study, but they suggest that the colour-pattern will be found to be distinct. As the two specimens are rather different from one another they are described separately.

Male.—Innsbruck, 5 June, 1894, Friese (B.M.). Differs from *B. j. jonellus* as follows :—Anterior thoracic collar rather broader ; basal two-thirds of second tergite with yellow hairs ; 4 black-haired ; 5 with some black hairs intermixed on the disc ; femora with many yellow hairs beneath, corbicular hairs red.

The other male—Innsbruck, 1 July, 1895, Friese (B.M.)—differs from the previous one as follows :—Most of mesopleuron yellow-haired, tergite 2 with only a few black hairs at apex ; tergites 5–7 mainly black-haired, with a few white ones intermixed ; corbicular hairs black.

The second specimen comes nearer the type as described by Gerstaecker.

It will be seen that in almost every case the territorial limits of these geographical forms are uncertain. In some cases it may be found impossible to treat the colour-forms as geographical when their distribution is better known. The author hopes that a summary of our present knowledge may stimulate the collection of further material.

The following key will serve to separate these varieties:—

1. Hairs of tail distinctly yellow. First and basal half of second tergites with yellow hairs. Corbicular hairs red-tipped	*hebridensis* Wild.
Hairs of tail not or scarcely yellow-tinged..	2.
2. Corbicular hairs red	3.
Corbicular hairs black	6. [(males).
3. Tergite 2 wholly yellow-haired	Var. *flavicolor* Friese
At most a few hairs at base of tergite 2 yellow	4.

4.	Tergite 1 yellow-haired	*jonellus* K.
	Tergite 1 black-haired	5.
5.	Tail white-haired	Var. *stygius*, nov.
	Tail almost entirely black-haired	Var. *obscuricauda* Ball.
6.	Tergite 1 black-haired	*suecicus* Friese.
	Tergite 1 yellow-haired	7.
7.	Third and at least base of fourth tergites black-haired	*martes* Gerst.
	Apex of third and whole of fourth tergites white-haired	8.
8.	Yellow thoracic collar broader. Second tergite with many yellow hairs. Tail with a yellow tint	*vogtii*, subsp. n.
	Yellow thoracic collar narrower. Second tergite with few or no yellow hairs. Tail white	*subborealis*, subsp. n.

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VI.—*Notes on the Roe-deer.*

By EDGAR N. BARCLAY.

THE range of the roe-deer extends roughly from Portugal in the west to Korea in the east, and from Sweden in the north to Persia in the south, but outside Western Europe its exact distribution is very imperfectly known.

The genus has hitherto been divided into four species :—*Capreolus capreolus* Linn., typical locality Sweden ;

C. pygargus Pallas, typical locality Altai; *C. bedfordi* Thomas, typical locality Shansi, China, and *C. coxi* Cheesman & Hinton, typical locality Kurdistan. Many local European races have been described as subspecies of *C. capreolus*, and various Asiatic races have been described as subspecies of either *C. pygargus* or *C. bedfordi*. From this arrangement, therefore, one is led to visualize the genus as comprising four forms of roe, each exhibiting specific characteristics and distributed roughly as follows:—*C. capreolus* Europe, *C. pygargus* Central Asia, *C. bedfordi* Eastern Asia, and *C. coxi* Persia.

From an examination of the whole of the material in the British Museum, however, I am of the opinion that this partitioning of their range from west to east is erroneous and directly opposed to the natural trend of their variation.

The principal purpose of the present paper, therefore, is to show that the roe of Central and Eastern Asia, which have hitherto been assigned to the species *C. pygargus* and *C. bedfordi*, more closely resemble the roe of Sweden (the type-locality of *C. capreolus*) than do the roe of Scotland, Spain, France, and Armenia, all of which have been regarded, and I think correctly, as merely subspecies of *C. capreolus*.

The principal variations to which roe-deer are subject may be summarized as follows:—

(i.) Coloration, length, and texture of coat.
(ii.) Size.
(iii.) Antlers.

Of these the first and second characters are the more important—they are therefore dealt with in the order given.

Comparison of Skins in Winter Coat.

That skins from the same locality vary somewhat both in coloration and markings is evident, and I think it probable that this factor has not been borne sufficiently in mind by those who have sought to establish subspecific rank for many so-called local races.

Owing to their complete isolation, a study of the roe-deer of Scotland and the Border country provides a useful key to individual variation; thus two skins in the collection, nos. 8.11.22.1 from Morayshire and 11.2.22.1 from Dumfriesshire, display a greater difference than do the respective types of *C. c. canus* (Spain) and *C. c. joffrei* (France). The Dumfriesshire skin differs from the Morayshire skin by being markedly darker along the spine from nape to rump and by its much blacker face-markings.

As an instance of the variability of markings that may occur in the same locality, there are in the Museum two mounted heads of adult bucks, both of which were shot by Capt. G. Fenwick Owen on the same day (31. x. 1911) in the N.E. Peling Mountains, China. One of these specimens has a distinct and broad throat-patch, which extends for nearly the whole length of the throat-whilst in the other the throat-patch is only faintly indicated and of very much smaller size. The coloration of the necks of these two specimens is also different, one being distinctly brownish and the other drab.

Leaving aside the question of minor variations in colour and markings, which is beyond the scope of the present paper, the majority of the winter skins examined fall naturally into three main groups :—

A. General colour a mixture of yellowish and greyish brown, hair long and inclined to be coarse.

B. General colour a darker greyish brown with little or no yellowish tinge, hair much shorter, less coarse but very dense.

C. General colour pale grey, hair short and less dense.

In addition to the skins summarized in the table on p. 69 there is in the collection the mounted head of a young male from Manchuria, which is pale grey, and there is also the mounted head of an adult buck from Mongolia, which is blackish brown. The hair of the latter is short, and probably, therefore, that of an animal in early winter coat.

Though all the skins tabulated conform to the general description applied to Group A, the coloration varies considerably. The similarity of the skin from Skabersjo, Sweden, to the one from Shansi, China, is, however,

GROUP A.

	Sex.	Locality.	Collector's date.	Length of coat.	Description.
B.M. no.				mm.	
10.10.18.1.	♂.	Skabersjo, Sweden.	22. ii. 1909.	40	General colour a mixture of yellowish and greyish brown. Hair inclined to be coarse.
8.8.7.99 (type of *bedfordi*).	♀.	100 miles N.W. of Tai-Yuan-Fu, Shansi (8000′).	25. xi. 1907.	39	General colour as in previous skin, but underparts slightly greyer, and insides of ears more white.
11.2.1.259.	♂.	60 miles S.E. of Min-chu, Kansu (8000′).	3. iii. 1910.	43	Same as for previous skin.
11.2.1.260.	♂.		Do.	41	Do. Do.
11.2.1.261.	♂.		5. iii. 1910.	44	Do. Do.
11.2.1.262.	♀.		3. iii. 1910.	41	Do. Do.
11.2.1.263.	♀.		7. iii. 1910.	38	Do. Do.
11.2.1.264.	♀.		8. iii. 1910.	41	Do. Do.
11.6.1.65.	♂.	30 miles S. of Feng-hsiang-fu, Shensi.	4. i. 1910.	44	Do. Do.
11.6.1.66.	♀.	Shensi (5000′).	3. i. 1910.	42	Do. Do.
11.6.1.67.	♀.	Shensi.	20. i. 1910.	40	Do. Do.
0.3.26.4.	♂.	Altai.	....	46	Do. Do.
0.6.9.1 (mounted).	♂.	Altai.	....	45	A much paler skin; more grey than brown; flanks and limbs yellowish. (May have faded somewhat through exposure to light.)
42.3.13.1.	....	Ticketed "? Siberia."	....	40	More yellowish all over than in previous skin. Has an almost golden appearance if held in a strong light.
13.2.6.3 (headless).	....	Kulja, Tian Shan.	....	26	Appears to be a skin with winter coat half grown. In this state it is almost indistinguishable from a typical Scotch skin (see Group B), except for its much larger size. Flanks and limbs slightly tinged with yellow.
97.10.3.57.	♀.	Korea.	....	43	General colour inclines more to rufous than in previous skins, but, judging by length of coat, it is from an animal in full winter pelage. Underparts markedly yellowish and hair rather less coarse.

most marked. The latter (no. 8.8.7.99) is "the type" of *C. bedfordi*, which Thomas described in 1908 *, but at that date there was no specimen from Sweden in the collection, so that his comparisons were presumably made with specimens from the British Isles and Southern and South-Central Europe, which are shorter-haired darker-coated animals.

The skin from Korea differs from the Chinese examples by its more rufous tinge. Lydekker † states that the species *C. pygargus* migrate during the winter "into Manchuria and apparently Korea," but he does not state the authority for this assertion. That some local migration of the roe of Eastern Siberia takes place annually may well be the case, but that the species as a whole—in which he includes the deer of the Altai, the Tian Shan, and other parts of Turkestan—ever accomplish such a feat seems quite incredible, as migration from the Tian Shan to Manchuria would involve a journey of about two thousand miles and the crossing of the Gobi Desert. This question is important, as any attempt to work out the local races of the roe-deer in Asia must be dependent on an accurate knowledge of any migratory movements that do occur. At the present time, there are, unfortunately, many northern localities from which there are no specimens in the collection, and it is impossible to state the northern limits of the roe-deer's range. E. Demidoff, Prince San Donato, records ‡ having shot them in the Urals, and he states that they are distributed all over these mountains; but whether they are to be found as far north as the Arctic Circle I cannot say. In 1874 the Zoological Society of London received two specimens from Finland (a male presented by Mr. J. Edensheim and a female presented by Mr. F. Hillel), so it would seem probable that the most northerly extension of their range in Western Europe is reached in that country.

Specimens are lacking from such intermediate countries as Germany, Poland, the Ukraine, and the Caucasus, but there are two skins in the collection which definitely

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* Proc. Zool. Soc. 1908, p. 645, pl. xxxii.

† Cat. Ung. Mamm. in Brit. Mus. vol. iv. p. 227 (1915).

‡ 'Sport in Europe,' p. 400 (1901).

	Sex.	Locality.	Collector's date.	Length of coat.	Description.
B.M. no.				mm.	
8.11.22.1 (type of *C. c. thotti*).	♂.	Arndilly, Craig Machie, Morayshire, Scotland.	12. xi. 1908.	33	General colour dark greyish brown; hair shorter, less coarse, but dense.
8.11.22.2.	♀.			31	Same as for previous skin.
11.2.22.1.	♂.	Thornhill, Dumfriesshire, Scotland.	10. i. 1911.	36	Dorsal surface and face more blackish brown than in previous skin.
11.2.22.2.	♀.			37	Same as for previous skin.
8.7.7.28 (type of *C. c. canus*).	♂.	Penares de Quintanar de la Sierra, Burgos, Spain.	....	36	General colour dark greyish brown.
8.7.7.27.	♂.		....	36	Same as for previous skin.
8.7.7.29.	♂.		....	34	Do. Do.
8.7.7.31.	♀.		....	38	Do. Do.
12.1.17.1 (type of *C. c. joffrei*).	♂.	Ferrières, France.	23. xii. 1911.	28	Do. Do.
10.11.17.1.	♂.		15. xi. 1910.	27	Do. Do.
11.11.18.1.	♀.		....	22	This skin is not dated, but the face displays a distinct reddish tinge and is probably that of an animal in early winter coat.
11.12.5.1.	....	Armanvillier, France.	....	27	General colour dark greyish brown.
6.3.6.188 (type of *C. c. armenius*).	♀.	Sumela, 30 miles S. of Trebizonde, Armenia (1000/1300 metres).	8. xi. 1905.	26	Same as for previous skin.
6.3.6.185.	♂.		27. x. 1905.	24	Do. Do.
6.3.6.186.	♂.		8. xi. 1905.	27	Do. Do.
6.3.6.187.	♀.		16. x. 1905.	22	Do. Do.
6.3.6.189.	♂.	Scalita, S. of Trebizonde, Armenia (700/1000 metres).	17. xi. 1905.	29	Do. Do.
6.3.6.224.	....		9. xii. 1905.	28	Do. Do.

intergrade between those in Groups A and B, the details of which are as follows :—

	Sex.	Locality.	Length of coat.	Description.
B.M. no.			mm.	
11.1.14.11.	♂.	Csehtelek, Hungary.	36	Dorsal surface brownish grey ; underparts grey ; traces of dirty yellowish on rump-patch and limbs.
10.12.14.1.	♀.	Nagy Varad, Hungarian-Rumanian border.	35	As in previous skin, but with a yellowish tinge on flanks.

These two skins are not dated, but from their grizzled appearance I judge them to be from animals in full winter coat. The coloration of the dorsal surfaces of both specimens is almost identical with Swedish and Chinese examples, but the underparts exhibit only very slight traces of yellowish and the faces of both are grey.

The general colour of the skins in Group B show very little variation, and noticeably less than do those in Group A. The table (p. 71) indicates that Group B contains examples of four named subspecies, but these are based on minor, and I think doubtful, characteristics that outside the scope of the present survey.

GROUP C.

	Sex.	Locality.	Length of coat.	Description.
B.M. no.			mm.	
21.7.17.4 (type of *C. coxi*).	♂.	Zakho, Kurdistan, W. Persia.	27	General colour pale grey, underparts white, faint trace of yellowish on the fringe of rump-patch, which is otherwise white; hair short and less dense.
21.7.17.3.	♀.		26	Do. Do.

Neither of the above skins of this apparently rare form of roe are dated, but attached to the male skin is an antler, half developed and in velvet, which indicates that the animal must have been in full winter coat when killed. The general colour of these skins is sharply

	Sex.	Locality.	Collector's date.	Description.
B.M. no. 0.3.26.5.	♂.	Altai.	....	General colour chestnut, slightly darker along the spine and darker face-markings; hair thick and coarse.
12.4.1.184.	♂.	Ala Tau, W. Dzungaria.	....	General colour light rufous; face-markings less pronounced; coat much less dense and hair not so coarse.
10.5.1.72.	♀.	Khingan Mts., China.	....	General colour rufous; no face-markings; coat as in previous skin.
9.1.18.4.	♀.	Padola, Cadore, Venetian Alps.	....	General colour more inclined to foxy-red; face-markings darker, coat as in previous skin.
8.8.18.1.	♂.	Cawdor, Scotland.	16. viii. 1908.	General colour foxy-red; blackish face-markings; coat as in previous skin.
8.8.18.2.	♀.			As in previous skin.
Mounted skin.	♂.	Whatcombe, Dorset *, England.	....	Do. Do.

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* The roe-deer of Dorset were re-introduced from Scotland at the beginning of the nineteenth century.

distinguished from those in Group B, but the concealed parts of the hairs show little or no variation and the yellowish hairs on the fringe of the rump-patch, a character not noticed in the original description, seem to point to their affinity to the deer of normal dark colour from the countries to the north. So far as is known, W. Persia is the most southerly extension of the roe-deer's range, and it seems probable that their pallid colour should be regarded as a local specialization, which is often loosely but effectively described as a "desert type," and which is apparently related to the extreme climate and poorness of the vegetation in that country.

COMPARISON OF SKINS IN SUMMER COAT.

The number of skins in summer pelage in the collection is insufficient to form a basis from which definite conclusions can be drawn, but such comparisons as are possible may be summarized as in table on p. 73.

SIZE.

In order to facilitate comparison, it will be convenient to summarize the results obtained under this heading in the following manner :—

(i.) Cranial Measurements.
(ii.) Flesh Measurements.
(iii.) Weights.

Comparison of Cranial Measurements. (See Table, p. 75.)

There appear to be no constant structural differences in the skulls of roe-deer from Europe, Central Asia, or Eastern Asia ; such variations as have been noted being merely a question of size. There are, unfortunately, no skulls of roe-deer from Kurdistan in the collection, and so far as I can trace there are no examples elsewhere. Dentition shows no variation, and though short-crowned and tall-crowned teeth have been stated to be characteristics of *C. capreolus* and *C. bedfordi* respectively *, I fail to recognize this character in the specimens examined.

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* Lydekker, Cat. Ung. Mamm. in Brit. Mus. vol. iv. pp. 218 & 219 (1915).

ranial Measurements of Adult Animals.

Locality.	Sex.	Condylo-basal length.	Zygo brea	
Altai.	♂.	225	99	07
Tian Shan (Khan Tengri).	♂.	222	99	05
W. Dzungaria.	♂.		97	02
Tian Shan (Fort Naryn).	♂.	....	91	01
Tian Shan.	♂.	215	92	01
Shansi (N.W. of Tai-Yuen-Fu	♂.	207	90	95
	♂.	207	90	95
Korea.	♀.	205	92	98
Shensi (30 miles S. of Feng-hsiang-fu	♀.	203	84	89
Kansu (60 miles S.E. of Minchou).	♀.	197	89	97
	♀.	196	89	92
S. Germany.	♂.	195	86	91
Hungary (Csehtelek).	♀.	192	84	87
Kansu (60 miles S.E. of Minchou).	♀.	191	89	91
Sweden (Skabersjö).	♀.	189	81	86
Spain (Burgos).	♂.	189	92	98
Padola, Cadore (Venetian Alps).	♀.	186	83	85
Armenia (Sumela).	♂.	185	87	89
France (Armanvillier).	♂.	184	84	90
S. Germany.	♂.	183	88	92
Spain (Burgos).	♂.	183	86	90
France (Rambouillet).	♀.	182	85	97
Armenia (Sumela).	♀.	181	85	87
Armenia (Scalita).	♂.	179	86	90
	♂.	....	84	88
Armenia (Sumela).	♀.	177	82	80
Scotland (Arndilly).	♀.	177	86	
	♂.	176	88	...
Scotland (Nairn).	♀.	....	87	90
	♀.	173	83	82

Flesh *of Ad* *An*

B.M. no.		Sex.	Length ead and	ngt tail	Length o
			.....		.....
11.2.1.261.	Kansu (60 miles S.E. of inchou)	♂.	219		39
11.2.1.262.		♀.	181		39
6.3.6.189.	Armenia (Scalita).	♂.	175		20
8.11.22.1 type of *C. c. thotti*).	Scotland (Arndilly).	♂.	173		25
11.2.1.264.	Kansu (60 miles S.E. o Minchou).	♀.	155		31
8.11.22.2.	Scotland (Arndilly).	♀.	150		27
11.2.1.259.	K su (60 miles S.E. o Minchou).	♂.	136		39
6.3.6.186.	Ar enia (Sumela).	♂.	130		30
11.6.1.67.	Sh si (100 miles S. of Feng-Hsiang-Fu)	♀.	129	..	30
8.8.7.99. (type of *C. bedfordi*).	Sh si (100 miles N.W. of Tai-Yuan-Fu)	♀.	125	50	64·
				65	30
11.2.1.263.	K su (60 miles S.E. of chou)	♀.	108	56	37
11.6.1.66.	Sh si (100 miles S. of F Fu	♀.	092	48	52
6.3.6.187.	A	♀.	090	..	25
6.3.6.185.		♂.	070	..	25
11.6.1.65.	Sh f	♂.	063	38	35

Flesh Measurements.

The statistics available under this heading are scanty and do not permit of many comparisons (see table on p. 76).

Weights.

The following table is compiled from reliable statistics collected from various sources over a period of some years:—

Average Weights of Adult Males (including Gralloch).

Locality.	Average weight.	Remarks.
	lb. avdp.	
Tian Shan.	98	Weight of one fully adult male.
Bosnia and Slavonia.	69	
Sweden.	64	
Galicia.	61	
W. Kansu.	60½	Average weight of three.
Transylvania.	60½	,, ,, four.
W. Prussia.	60	
Hungary.	59½	
England (Dorset).	59½	
East Prussia.	58	
Bohemia.	55	
German Silesia.	54	
Moravia.	52	
Styria.	51	
Hesse.	50½	
Scotland.	50	
Tyrol.	49½	
Brunswick.	48	

The under-mentioned works have also been consulted:—

Morden, William J. 'Across Asia's Snows and Deserts,' 1927.

Raesfeld, F. v. 'Das Rehwild,' 1923.

Thott, Tage. 'Vart Villebrad,' Häft 5.

Wallace, H. Frank. 'The Big Game of Central and Western China,' 1913.

——. 'Hunting and Stalking the Deer,' 1927.

The weights quoted include the weight of the gralloch, and are based on the average of five or more adult bucks from each locality. In cases where the average is based on less than five animals the number is stated.

I cannot trace that weights of the roe-deer of W. Persia have ever been recorded, but the two flat skins in the British Museum, which are from adult animals, are about equal in size to the skins of adult animals from Scotland.

Individual weights may considerably exceed the average for a particular locality. As an example, though the average of adult males in East Prussia appears to be 58 lb., Baron Donald Schönberg has recorded * that a buck shot on Count Dohna Schlobitten's Proekelwitz estate weighed 71 lb. clean. This animal, therefore, can hardly have weighed less than 82 lb. as it fell, and in all probability it weighed a pound or two more. From the same country E. v. Dombrowski has recorded † an even heavier animal, a buck with a clean weight of 39 kg. (85·8 lb.), which represents a live weight of at least 100 lb. In Scotland, though the average is but 50 lb., Lieut.-Col. Pelham Burn killed a buck at Ballindalloch that weighed 68 lb. ‡.

ANTLERS.

The antlers of roe are short in relation to their shoulder-height, and light in relation to their body-weight, a specialization probably due to the nature of their habitat, which is typically rough woodland, and not fully-developed timber.

Though easily distinguished from the antlers of all other deer, they yet display infinite variety, and it is difficult to define types. They may, however, be roughly described as inclining to one or other of two forms:—Almost parallel and nearly straight, or divergent and usually more curved.

It is, I think, possible that the examination of a sufficient number of specimens would show that the tendency to grow widely divergent antlers is related to the nature of the habitat, and that this type may be expected to occur in the more open countries and where the undergrowth is not dense. Furthermore, it is noticeable that in very large examples of this type the extra growth of horn tends to increase the length of the antlers rather than the girth, and it is also in this type that additional points above the usual number of six most commonly occur. In large examples of the other type, exceptional growth is more usually displayed in the form of massive antlers with large coronets. It has frequently been

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* 'Sport in Europe,' p. 156 (1901).

† 'Das Rehwild,' p. 316 (1923). ‡ 'The Field,' January 3, 1931.

observed by sportsmen, and others, that in the antlers of roe from Central Asia the coronets seldom or never meet, as is sometimes the case in large examples from Europe. It might therefore be thought that the pedicles themselves are set further apart, but in the specimens examined this is not the case, and the explanation appears to be that the antlers of the roe of Central Asia tend to a longer but relatively less massive growth, and that a large proportion are of the divergent type. These characteristics, together with the fact that the coronets themselves are usually poorly developed, account for the pronounced space that usually occurs between them.

That well-developed antlers from the Tian Shan present a very different appearance to those grown by roe in Scotland is certainly so, but that there is anything inherently different about them I do not believe, and horns of young males from the former locality are indistinguishable from those of other countries. As an example of this, the following are the dimensions of two heads in the British Museum :—

	Locality.	Length of outside curve.	Circumference above coronet.	Tip to tip.	Points.
B.M. no.					
32.7.6.17.	Tian Shan.	11 ins.	2½ ins.	9¼ ins.	6
32.7.6.16.	Scotland (Moy).	9 ins.	2½ ins.	7¼ ins.	6

Neither of these heads are large examples for their respective localities, but in type and general appearance they are very much alike.

That the antlers of roe should attain their largest size in the Tian Shan is in no way remarkable, since other ungulates appear to reach their highest development in this same range.

Generally speaking, the size of antlers is in proportion to the size of the animals themselves, though individuals of exceptional weight for any particular locality rarely develop larger antlers than do animals of normal weight.

That the antlers of roe are responsive to certain qualities of pasture and browsing is shown by the introduction of Scottish animals to Lissadell, Ireland, where these imported roe produced horns of much greater weight than any known Scottish specimens.

The three following examples indicate the massive nature of the antlers of these Irish deer * :—

(1) A twelve-point head (found dead): Length of right horn 9½ ins. Length of left horn 9¾ ins. Circumference of right coronet 8⅛ ins.
(2) A cast horn: Length 9 ins. Circumference of coronet 9 ins.
(3) A cast horn: Circumference of coronet 9¼ ins.

There are in the British Museum three single antlers from W. Persia, which have apparently been sawn off the skulls by native hunters. These specimens are in no way different from the antlers of European roe. The longest of the three measures 8½ ins. on the outside curve, has the normal three points, and is well pearled over the basal half.

No attempt is made to give individual descriptions of all the antlers examined, and, owing to their extreme variability, they can, I think, be ignored as sources of specific characters.

CONCLUSIONS.

The conclusions to be drawn from the survey are, I think, as follows :—

(1) The roe-deer of Shansi, China, very closely resemble the roe-deer of Sweden in all characters.

(2) The roe-deer of Central Asia, though resembling the roe-deer of Shansi and Sweden, are larger, but this difference in size is no greater than is the difference between local races in Europe.

(3) The roe-deer of W. Persia only differ from the roe-deer of Southern and South-Central Europe by their coloration, but their affinity to the deer of the latter countries is shown by the coloration of the concealed parts of the hair, by the length and texture of coat, and by similarity of size.

From these facts I conclude that there is but one species of roe-deer, and that the names *pygargus*, *bedfordi*, and *coxi* should therefore be regarded as synonyms of *capreolus*.

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* Recorded by J. G. Millais, 'British Deer and their Horns' (1897).

VII.—*Seven new Indian Species of Heterocerid Coleoptera.*

By RICHARD MAMITZA, Vienna.

IN a collection of Indian Heteroceridæ submitted to me for identification by the British Museum, London, and consisting chiefly of the captures of Messrs. H. G. and F. W. Champion, I have been able to recognize seven new species, the descriptions of which are here given. The types of these species are in the possession of the British Museum. I desire to express my best thanks for the submission to me of this collection by Mr. G. J. Arrow, of that institution, who has also kindly undertaken the translation into English of the present paper.

Heterocerus (s. str.) *virgatus*, sp. n. (Figs. 1–4.)

Elongate, about two and a half times as long as broad, convex, slightly shining, brownish black to black, lateral margin of thorax and elytral markings yellow.

Head (including eyes) a little broader than its length (including mandibles), black, closely and finely punctured, closely covered with short yellow hairs, directed forward. Mandibles (fig. 1) brown, moderately long, armed internally with two sharp teeth, slightly notched near the middle externally, the basal lobe only feebly represented. Labrum (fig. 2) somewhat broader than long, broadest at the base, the sides parallel almost to the middle, then curvilinearly converging, the front margin slightly reflexed. Antennæ 11-jointed, the base yellow, the 7-jointed club brown. Near the middle of the front margin of the clypeus in the male are two short stout upwardly directed spines.

Thorax nearly twice as broad as long, as broad as the base of the elytra, rather broader in the male, closely and finely punctured, and closely clothed with rather short, yellow, forward pointing hairs, those at the sides mixed with long fine hairs. Sides curvilinearly contracted anteriorly, the front angles strongly and the hind angles feebly rounded. Base rounded, distinctly margined as far as the hind angles. Lateral margin, and in pale examples also the front margin, and the median line yellow. Scutellum black, triangular, a little longer than broad.

Elytra a little more than one and a half times as long as broad conjointly, parallel at the sides, slightly impressed behind the shoulders, the terminal third jointly rounded. Elytra finely and closely punctured, interstices very finely punctulate, the disc distinctly striate, the yellow clothing consisting of short, decumbent, and rather long, erect, backwardly directed hairs. The yellow pattern of the elytra (fig. 3) consists of a subhumeral patch united with the lateral margin, and embracing hook-like the humeral callus, second an elongate spot near the suture upon the first third, a third spot placed behind the middle and touching the fourth, which is united with the lateral margins, a fifth before the apex also united with the lateral margin. The yellow lateral margin is narrow at the shoulder, becomes broader before the middle, and extends to the apex.

Fig. 1.

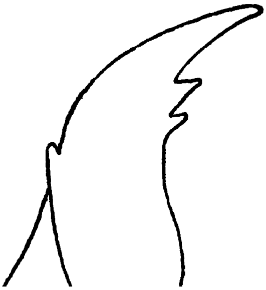


Fig. 2.

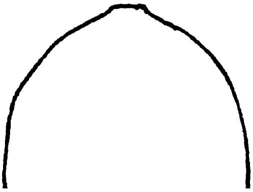


Fig. 3.

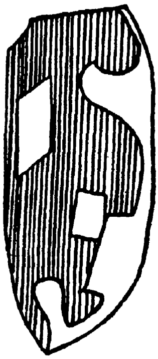
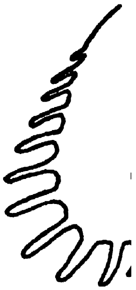


Fig. 4.



Heterocerus (s. str.) *virgatus*, sp. n.

Underside yellow, fairly closely clothed, finely and closely punctured. There is a line extending obliquely from the middle coxa towards the lateral margin. Femoral line of the first abdominal sternite incomplete, ending at the hind margin of the sternite. Epipleuræ yellow.

Legs yellow, the front tibia (fig. 4) armed with eleven slender spines, becoming longer towards the extremity.

Length 3·25–3·6 mm.

BENGAL : Sunderbans (*F. W. Champion*).

Four examples.

Fig. 5.

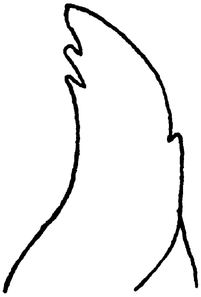


Fig. 6.

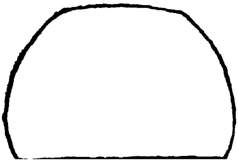


Fig. 7.

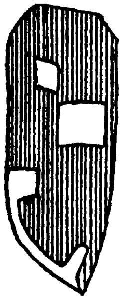
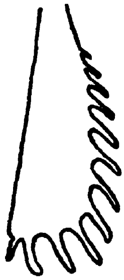


Fig. 8.



Heterocerus (s. str.) *magnus*, sp. n.

Heterocerus (s. str.) *magnus*, sp. n. (Figs. 5–8.)

Elongate, about two and a half times as long as broad, moderately convex, brownish black to black, elytral markings reddish yellow or yellow.

Head (including eyes) a little broader than its length (including mandibles), closely and moderately finely punctured, closely covered with rather short yellow hairs, directed forwards. Mandibles (fig. 5) brown, short and broad, bearing two short blunt teeth at the inner edge near the blunt apex, slightly notched before the middle of the outer edge, and without basal lobe. The labrum (fig. 6) is a little broader than long, broadest before the base, posteriorly feebly and anteriorly strongly narrowed, the front margin slightly reflexed. Antennæ black, 11-jointed, with a 7-jointed club.

Thorax almost twice as broad as long, finely and closely punctured, clothed with yellow forward-directed hairs, the base distinctly margined as far as the hind angles. Scutellum triangular, rather longer than broad, depressed. Thorax of the male broadest at two-thirds of its length, rather broader than the base of the elytra; the front and hind angles strongly rounded, the sides almost parallel; thorax of the female broadest near the base, as broad as the base of the elytra, the front angles strongly and the hind angles feebly rounded, the sides curvilinearly converging anteriorly.

Elytra nearly twice as long as their conjoint width, scarcely visibly impressed behind the shoulders, parallel at the sides, conjointly rounded in the apical third, finely and closely punctured, the disc scarcely perceptibly striate, the yellow clothing short, decumbent, directed backwards, with a few long obliquely erect hairs intermixed. The elytra pattern (fig. 7) consists of four reddish-yellow or yellow marks, the first behind the shoulder prominence, the second near the suture before the middle, the third at two-thirds of the length is united with the outer margin, and the fourth just before the apex is also united with the yellow outer margin, which extends from two-thirds to the apex.

Underside black, with close yellow hair, finely and closely punctured, the metasternal suture and the femoral lines as in the preceding species.

Legs yellow, with the tibiæ partly or entirely black, the front tibiæ (fig. 8) bearing twelve spines.

Length 5 mm.

BENGAL: Hardwar (*H. G. Champion*).

UNITED PROV.: Haldwani Dist., Kumaon (*H. G. Champion*).

PUNJAB: Thobba, Murree Hills (*Howland Roberts*).

Three specimens.

Heterocerus (*Littorimus*) *variabilis*, sp. n. (Figs. 9–13.)

In this species the males are easily distinguishable from the females, the male being elongate, cylindrical, and strongly convex and the female moderately broad, rather oval, and slightly convex. The pattern of thorax and elytra also is well developed and recognizable in the female, whereas in the male the markings are reduced and sometimes hardly visible.

Fig. 9.

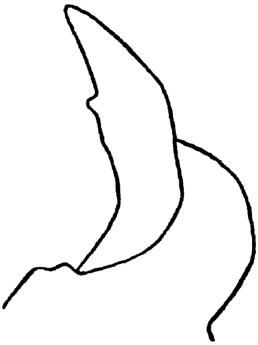


Fig. 10.

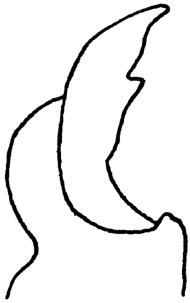


Fig. 11.

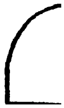


Fig. 12.

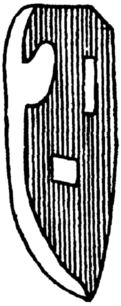
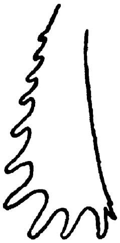


Fig. 13.



Heterocerus (*Littorimus*) *variabilis*, sp. n.

Head black, a little broader (including the eyes) than its length (including the mandibles), finely and closely punctured, clothed with whitish-yellow hairs directed forward, the eye-margins bearing long erect bristles. Mandibles brown, with a strong blunt tooth at the inner edge ; those of the male (fig. 9) long, the apical part only very slightly rounded and the basal lobe strongly developed ;

those of the female (fig. 10) rather shorter, the apical part rounded and the basal lobe fairly well developed. The labrum (fig. 11) is twice as broad as long, broadest at the base, with the sides parallel in the male, slightly converging before the middle in the female, the front margin slightly oblique at the sides, excised in the middle. Maxillary and labial palpi brown, antennæ dark brown, 11-jointed, with 7-jointed club.

Thorax black, with yellow or reddish marking, at the base almost twice as broad as long, closely and finely punctured, clothed with very short whitish-yellow hair, the base distinctly margined as far as the hind angles. In the male the sides of the thorax are parallel, the front and hind angles well marked, the base as wide as or a little wider than the elytra, the front angles and often the sides also reddish. In the female the sides are parallel to the middle, then strongly contracted to the front, the front angles strongly and the hind angles moderately rounded and the base as broad or a little narrower than the elytra. The front angles, the lateral margins, and often also the hind angles are yellow.

Elytra almost twice as long as their united breadth, impressed behind the shoulder, the sides parallel, in the male behind the middle, in the female at two-thirds of the length conjointly rounded, the surface striate, finely and closely punctured, with very fine interstitial punctulation. The whitish-yellow clothing is fairly short and close, erect and directed obliquely backwards. The yellow or reddish markings of the elytra (fig. 12), which are generally less well developed in the male, consist of a shoulder-spot, an elongate spot near the suture upon the anterior one-third but not reaching the base, and a small spot behind the middle. The lateral margin from base to apex in the female and upon the posterior half only in the male is yellow or reddish brown.

Underside dark brown to black, outer margin of the abdomen yellow. The metasternum bears an oblique line on each side extending from the middle of the middle coxa to the middle of the lateral margin. Prosternum and metasternum finely rugulose. Abdomen very finely punctured, clothing fairly short, yellow. Femoral lines of the first abdominal sternite entire, curving back internally from the hind margin of the segment to the base. Legs brownish yellow, the front tibia (fig. 13), which is armed with ten or eleven spines, dark.

Length 2·75–4 mm.

BENGAL : Sarda (*F. W. Champion*).

UNITED PROV. : Kumaon, Tanakpur, Haldwani, Ranikhet, W. Bhatkot, 4000 ft., Khaula, 4500 ft., Almora (*H. G. Champion*).

About eighty examples of this interesting species are contained in the collection.

Heterocerus (*Littorimus*) *laticollis*, sp. n. (Figs. 14–16.)

Allied to *H. micans* Mamitza, from which it is easily distinguished by the broader and shorter thorax and entirely yellow legs.

Elongate, about two and a half times as long as broad, not very convex, shining, the upper surface black (immature examples brown), without trace of markings.

Fig. 14.

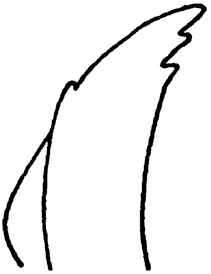


Fig. 15.

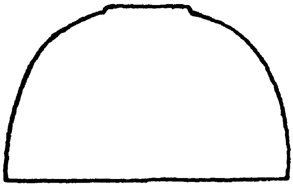
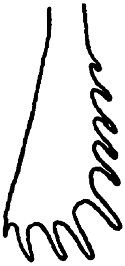


Fig. 16.



Heterocerus (*Littorimus*) *laticollis*, sp. n.

Head rather broader (including the eyes) than long (including mandibles), closely and finely punctured, clothed with short yellow hairs directed forward. Mandibles (fig. 14) yellowish brown, fairly long, armed near the blunt tip with a small blunt tooth, behind which is a rather larger one; the external basal lobe is feeble. Maxillary and labial palpi yellow, antennæ 11-jointed, yellow at the base, the 7-jointed club brown. Labrum (fig. 15) nearly one and a half times as broad as long, broadest at the base, with the sides parallel to the middle, then arcuately converging, the front margin sloping.

Thorax at the base twice or a little more than twice as broad as long, closely and finely punctured, with very short yellow hair, the base margined as far as the hind angles, the sides almost parallel to the middle, very strongly convergent anteriorly. Scutellum triangular, one and a half times as long as broad at the base, and not depressed.

Elytra about one and a half times as long as their conjoint width, slightly impressed behind the shoulders, broadest behind the middle, with the last third part conjointly rounded, the surface distinctly striate, very finely and closely punctured, the yellow clothing short and close and directed obliquely backward.

Underside dark brown, the lateral margin of the abdomen and in some examples that of the prosternum also yellow. There is an oblique line extending from the middle coxa towards the outer margin. Prosternum and metasternum finely, abdomen coarsely and rugosely punctured, the clothing yellow, short and close. Femoral lines of the first abdominal sternite entire, curving back from the hind margin to the base. Legs yellow, the front tibia (fig. 15) armed with ten spines.

Length 3·25–5·25 mm.

BENGAL : Sarda (*F. W. Champion*).

UNITED PROV. : Kumaon, Haldwani Dist., Ranikhet Dist., W. Almora, W. Bhatkot, 4000 ft., Sarju Valley, 5000 ft. (*H. G. Champion*).

About fifty examples have been submitted to me.

Heterocerus (*Littorimus*) *fornicatus*, sp. n. (Figs. 17–20.)

Elongate, nearly three times as long as broad, very convex, slightly shining, reddish brown, elytral markings yellow.

Head (with mandibles) almost as long as broad (with eyes), closely and finely punctured, closely clothed with yellow hairs directed forward. Mandible (fig. 17) brown, rather long, with two strong internal teeth, fairly deeply notched before the middle of the outer edge, the basal lobe well developed. The labrum (fig. 18) is a little broader than long, broadest before the base, with the sides parallel as far as the first third, then arcuately converging, the front margin sloping. Antennæ brown, 11-jointed, with 7-jointed club.

Thorax one and a half times as broad as long, as broad as the base of the elytra, finely and closely punctured, fairly closely clothed with short yellow hairs, which are intermixed with long hairs at the sides. Sides parallel, the front angles strongly and the hind angles feebly rounded, the base rounded and finely margined as far as the hind angles. Scutellum depressed, relatively small, triangular, rather longer than broad.

Elytra nearly twice as long as their conjoint width, almost parallel at the sides, broadest behind the middle, their last third conjointly rounded; rather finely and closely punctured, with fine interstitial puncturation, the disc hardly perceptibly striate, the yellow clothing short, erect, pointing obliquely backwards. The yellow markings (fig. 19) consist of a longitudinal mark near the suture, not reaching the base, a subhumeral spot, and a C-shaped mark upon the posterior half, both united with the lateral border. In one of the specimens before me the two extremities of the C-shaped mark are united and the longitudinal mark near the suture reaches the base. The yellow lateral border extends to the apex.

Fig. 17.

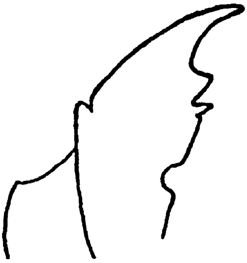


Fig. 18.

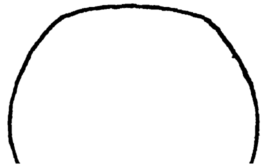


Fig. 19.

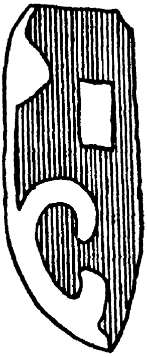
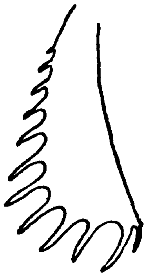


Fig. 20.



Heterocerus (*Littorimus*) *fornicatus*, sp. n.

Underside light brown, finely and closely punctured, with close short whitish-yellow hair, the metasternal suture and femoral lines as in the preceding species. Legs reddish brown, the front tibia (fig. 20) armed with eleven spines.

Length 4–4·5 mm.

Bengal : Sunderbans (*F. W. Champion*).

Three specimens.

Fig. 21.

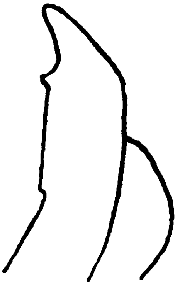


Fig. 22.

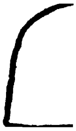


Fig. 23.

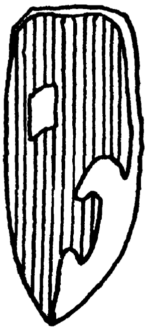
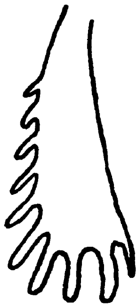


Fig. 24.



Heterocerus (*Littorimus*) *exiguus*, sp. n.

Heterocerus (*Littorimus*) *exiguus*, sp. n. (Figs. 21-24.)

Resembling the Palæarctic *H. sericans* Kies., in form and markings, but a little smaller, and easily distinguishable by the inner branches of the femoral lines lying almost parallel.

Elongate, about two and a half times as long as broad, feebly convex, scarcely shining.

Head black, a little broader (including the eyes) than long (including the mandibles), closely and finely punctured, clothed with short whitish-yellow hairs directed forward. Mandibles (fig. 21) brown, bearing a blunt tooth on the inner edge, the outer basal lobe well-developed. Maxillary and labial palpi yellow, antennæ 11-jointed, yellow at the base, with the 7-jointed club brown. The labrum (fig. 22) is one and a half times as broad as long, with the sides parallel, the front angles rounded, the front margin a little reflexed.

Thorax black, with the front angles, lateral margin, base, and longitudinal median line reddish yellow, finely and closely punctured, clothed with yellow hairs directed forward. The thorax is one and half times as broad as long, the sides almost parallel, the front angles strongly rounded, the hind angles distinct, and the base margined as far as the hind angles. Scutellum triangular, nearly twice as long as wide at the base, depressed.

Elytra about one and a half times as long as their conjoint breadth, slightly impressed behind the shoulders, the sides parallel, jointly rounded in the terminal third, the disc striate, closely punctured, with fine interstitial punctulation. The yellow clothing short and close, decumbent, mixed with longer erect hairs. The yellow pattern (fig. 23) consists of a longitudinal spot near the suture, not attaining the base, and a C-shaped mark upon the posterior half united with the lateral border. Lateral margin broadly and base narrowly yellow, the suture reddish yellow.

Underside brownish yellow, with the sides of the metasternum and middle of the abdomen black. Metasternal suture as in *H. laticollis*. Femoral lines of the first abdominal sternite entire, the inner branch forming an obtuse angle with the hind marginal arc.

Legs yellow, the front tibia (fig. 24) armed with ten spines.

Length 2 mm.

BENGAL : Sarda (*F. W. Champion*).

Four similar specimens.

Heterocerus (*Littorimus*) *castaneus*, sp. n. (Figs. 25–28.)

Rather more than twice as long as broad, convex, shining, reddish brown, with yellow markings.

Head (including the eyes) rather broader than long (including the mandibles), reddish brown, closely and finely punctured, clothed with moderately long golden-yellow hairs, directed forward. Mandibles (fig. 25) brown, the inner edge bearing two teeth, the outer edge slightly notched before the middle, the basal lobe well developed. Antennæ, maxillary and labial palpi brown, the first 11-jointed, with 7-jointed club. The labrum (fig. 26) is one and a half times as broad as long, broadest at the base, the sides parallel to the middle, then strongly convergent, the front margin a little excised.

Fig. 25.

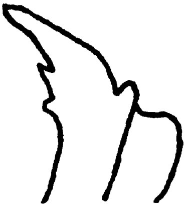


Fig. 26.

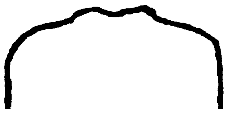


Fig. 27.

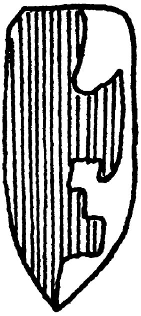
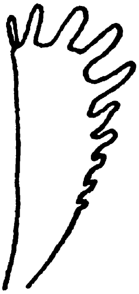


Fig. 28.



Heterocerus (*Littorimus*) *castaneus*, sp. n.

Thorax brown, in the male rather broader than the elytra at the base and twice as broad as long, in the female as broad as long. The base is completely margined, rounded, the sides converge a little in front, the front angles are rounded and the hind angles distinct. The surface is very finely and closely punctured and clothed with fairly short yellow hair. Scutellum triangular, a little longer than broad, depressed.

Elytra one and a half times as long as their conjoint width, only very slightly impressed behind the shoulders, closely and finely punctured, the disc not striate, the yellow clothing close and rather long, directed obliquely backward, the sides almost parallel, conjointly rounded in the last third. The yellow pattern of the elytra (fig. 27) consists of a more or less developed shoulder-spot, a zigzag transverse bar behind the middle united with the lateral border and not reaching the suture, and a spot before the apex. In many examples the shoulder-spot extends at the base as far as the scutellum, and sometimes the suture is yellow from the base to two-thirds of its length.

Underside reddish brown, with the lateral margin of the abdomen and the epipleuræ yellow. The metasternum has an oblique line on each side extending from the middle of the middle coxa towards the middle of the lateral margin. Femoral lines as in *H. laticollis*.

Legs brown, tarsi yellow, the front tibia (fig. 28) armed with ten strong spines.

Length 2–2·5 mm.

UNITED PROV.: Haldwani, Kumaon (*H. G. Champion*). About forty examples.

VIII.—*Coleoptera collected by the Oxford University Expedition to Akpatok Island, Ungava Bay, Aug.–Sept.* 1931. By K. G. BLAIR, B.Sc., F.E.S., Department of Entomology, British Museum (Nat. Hist.).

THE beetles obtained by the Expedition were not numerous either in species or in individuals, and are either ground-dwellers or aquatic in habit, and of holarctic type, either identical with or closely allied to species inhabiting Arctic Europe. Two species, however, are described as new; the types of these are in the British Museum and paratypes in the Hope Department, Oxford.

Carabidæ.

1. *Cryobius mandibularis* Kby.; Richardson's Fauna Boreali-Americana, iv. 1837, p. 31 (*Argutor*).

1 ♂, 4 ♀ (*D. H. S. Davis*); 1 ex. under stone on stony slope in ravine, S.E. Akpatok Is.; 4 ex. under stones on rough ground c. 40 ft., Port Burwell.

Kirby's type was from Hudsons Bay Territory.

2. *Curtonotus brunnipennis* Dej.; Spec. Gen. Col. v. 1831, p. 800 (*Amara*).

1 ♂ (*I. H. Cox*), under stone in old Eskimo grave on stony slope with open vegetation of *Dryas*, *Salix arctica*, &c.

Described from Labrador. Leng gives its further distribution as Colorado and Alaska.

Very similar to the European *C. alpinus* Payk.

Dytiscidæ.

(For confirmation of these determinations I am indebted to Dr. Melville H. Hatch, of the University of Washington.)

3. *Hydroporus glabriusculus* Aub.; Icon. Col. v. 1836, p. 312, pl. xxxvi. fig. 4.

11 ex. (*D. H. S. D.*), in shallow pools and tarns in marshy areas.

A species of holarctic distribution.

4. *H. tartaricus* Lec.; Agassiz, Lake Super. iv. 1850, p. 215.

1 ex. (*D. H. S. D.*), in bog-pool, valley head.

Also of holarctic distribution. The specimen agrees well with *H. nigellus* Mann. of the Sharp Collection. The synonymy of these two is regarded as doubtful by Leng, but admitted by Zimmermann in Junk, Coleopt. Cat. pars 71 (1920).

5. *Agabus semipunctatus* Kby.; Richardson's Faun. Bor.-Amer. iv. 1837 p. 69 (*Colymbites*).

Many examples (*D. H. S. D.*), in bog-pools, valley head.

As given by Leng the distribution of this species is Labrador, Massachusetts, and Lake Superior.

Staphylinidæ.

6. *Atheta* sp.

1 ex. (*D. H. S. D.*), under stone at valley head.

A small entirely black species, with very short tarsi, quite unlike any species known to Dr. M. Cameron or myself; but, as the antennæ are unfortunately lacking, it is impossible to place it.

7. *Olophrum boreale* Payk.; Mon. Curc. App. 1792, p. 146.

=*Lathrimæum marginatum* Kby. (1837); Richardson's Faun. Bor.-Amer. iv. 1837, p. 89.

3 ex. (*D. H. S. D.*), under stone in dry watercourse; at grass-roots in shingle above high-water mark; Port Burwell (this example lacks head and thorax).

O. boreale is recorded only from northern Norway, Lapland, and recently from Bear Island.

Kirby's type now lacks the antennæ and abdomen, but does not appear to differ in any essential from the

European species. Bernhauer, in Junk, Coleopt. Cat. (1910), places *marginatum* Kby. in synonymy with *L. sordidum* Er., a species which is unknown to me, and Leng, 1920, accepts with doubt the same synonymy. Kirby's insect is, however, an *Olophrum*, and may be identical, *ex desc.*, with *O. latum* Mäkl., though not with *O. fuscum* Grav. This transference of Kirby's species to *Olophrum* renders a new name necessary for *O. marginatum* Mäkl. (1853), for which I propose *marginicolle*, nom. nov.

8. *Boreaphilus nearcticus*, sp. n.

Dark pitchy brown, the base of antennæ, mouth-parts, and legs paler. Head and thorax finely, rather sparsely punctate and pubescent, with interspaces dull alutaceous. Head slightly expanded behind the eyes; frons with two broad shallow impressions, each with a fovea, between the eyes; clypeus shining, impunctate. Antennæ moderately slender, penultimate joints quadrate. Prothorax scarcely longer than wide, scultpure similar to that of the head; a broad median impression in front and a U-shaped impression before base. Elytra half as long again as thorax, rather strongly widened behind (length : width across shoulders : width behind = 9 : 6 : 8), with a shallow impression behind base; punctures asperate, stronger and rather closer than those of thorax; interspaces shining. Abdomen rather more finely and closely punctured than thorax, with interspaces alutaceous.

Length 4–4·5 mm.

2 ex. (*D. H. S. D.*), under stones on rough valley slope.

Differs from *B. americanus* Notm. (Journ. N. York Ent. Soc. xxvi. 1918, p. 188, fig. 1), the only species of the genus hitherto known from North America, in puncturation, the latter species having the head and thorax strongly and coarsely punctured, with interspaces smooth and shining. Of the Palæarctic species it would appear to be most closely allied to *B. nordenskiöldi* Mäkl., though this species (*ex. descr.* Œfv. Finsk. Vet. Soc. Förh. xix. 1876–77, p. 25) has a much longer thorax, closely and finely punctured. The figure given by Sahlberg (Kongl. Svensk. Vetens.-Akad. Handl. xvii. no. 4, 1880, pl. i. fig. 18) does not agree well with Mäklin's description, but might well represent the insect above described, which may therefore prove to have a holarctic distribution.

Cryptophagidæ.

9. *Cryptophagus dentatus* Herbst, Käf. v. 1793, p. 15, fig. 6, *f*, F (*Kateretes*).

1 ex. (*H. P. Hanham*), in lunch (? accident).

No doubt a casual introduction with the stores of the expedition.

Curculionidæ.

10. *Lepyrus labradorensis*, sp. n.

Elongate-ovate, with a moderately even, not very dense clothing of depressed brownish hairs, with which a few white hairs are intermingled. The elytra exhibit faint maculations due to patches of denser pubescence, but the pale discal and subapical spots commonly found in the genus are not developed ; the two lines of white pubescence on the thorax are well marked and placed in a slight depression. Rostrum with a median smooth carina running from between the antennal bases to an elongate fovea between the eyes ; first two joints of the funicle elongate, but not twice as long as broad, the next four subequal, about as long as broad, the seventh enlarged, forming part of the club. Thorax feebly transverse, widest a little before the middle, not much wider at base than at apex ; median carina obliterated at base. Elytra twice as long as wide, not much wider at base than base of thorax ; punctures of striæ small, elongate, fairly distinct ; intervals not very obviously granulate, the odd intervals scarcely wider or more elevated than the even ; apices feebly mucronate, with a small hiatus.

Length from front of thorax to apex of elytra, 12 mm.

2 ex. (*H. M. Clutterbuck* and *N. V. Polunin*), amongst thick mat of closed vegetation on sheltered valley slope, c. 100 ft.

Allied to and possibly only a variety of *L. nordenskiöldi* Fst., differing in its larger size and more elongate form as well as in elytral sculpture. It would come nearest to the subsp. *cinereus* Van Dyke, but differs in the more even elytral intervals and in the brown instead of cinereous clothing, which, though indistinctly maculate, is not at all vittate. Dr. Van Dyke, who has seen the specimens, is of the opinion that they represent a species distinct from *nordenskiöldi* (Van Dyke, Pan-Pacific Entom. v. 1928, pp. 53–58).

IX.—*Entomological Expedition to Abyssinia,* 1926–7. *Hymenoptera,* III.*: Tenthredinidæ, Formicidæ, Mutillidæ, Scoliidæ, Masaridæ, Vespidæ. By ROBERT B. BENSON, J. BEQUAERT, A. v. SCHULTHESS, and HUGH SCOTT.

Introduction. By HUGH SCOTT.

The longest part of this paper, that on Vespidæ, is contributed by Dr. Bequaert. Mr. Benson is responsible for the section on Tenthredinidæ, and Dr. Schulthess for that on Masaridæ. I have compiled the remaining parts, which are based on determinations by the following experts, to whom I express my thanks: Dr. H. Bischoff (Mutillidæ), Prof. J. Chester Bradley and Mr. R. E. Turner (Scoliidæ), Mr. H. Donisthorpe (Formicidæ).

Though the material included several species new to science, no descriptions of new species appear in this paper. Four of the species of ants were new, but descriptions of them have already appeared elsewhere, as explained below. The single representative of Tenthredinidæ, a species originally described from a unique specimen, is redescribed from several examples of both sexes, and, in the single species of Masaridæ, a specimen deviating somewhat from the type is described. Some of the Mutillidæ and Scoliidæ listed, which have had to be left undetermined, may eventually prove to be new (also the Tiphiidæ and Bethylidæ mentioned in the note after Scoliidæ).

Biogeographical.—The scarcity of sawflies, both in species and individuals, and even at high altitudes where the climate is temperate, bears out the view that Tenthredinidæ, as a whole, are less richly represented in tropical than in northern latitudes.

The records of locality, altitude, and general distribution are of considerable interest. In one case we appear to have a northern element either extending into, or left isolated in, the Ethiopian Region: a solitary wasp, *Ancistrocerus zebra*, found in several places at altitudes between 8000 and 10,000 feet, is regarded by Bequaert as the Abyssinian representative of a group of species constituting "one of the best examples of Palæarctic faunal types that have invaded the highlands of the Ethiopian Region in the eastern half of the continent, some of them eventually reaching South Africa."

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* "Hymenoptera, I.: Apoidea (exclusive of *Andrena* and *Halictus*)," by J. D. Alfken (annotated by Hugh Scott), appeared in Trans. Ent. Soc. London, lxxx. pp. 47–55, 1932. "Hymenoptera, II.: Sphegidæ and Psammocharidæ," by G. Arnold (with Introductory Note and Supplementary List by Hugh Scott), in Ann. & Mag. Nat. Hist. (10) xi. pp. 351–371, 1933. It is hoped that Hymenoptera, IV., by P. Blüthgen, on *Halictus* and related genera of Apoidea, will appear before long, to complete the account of the aculeate Hymenoptera collected by the Expedition. The material of Ichneumonidæ and other parasitic families is too fragmentary to be worked out on a faunistic basis in the present state of knowledge.

Besides the new species discovered, a few of the other forms are recorded only from Abyssinia, or only from Abyssinia and countries immediately adjacent on the north-east and east. Thus, the Scoliid (Tiphiid) *Myzine kristenseni* is recorded only from Abyssinia, *Odynerus silaos asmarensis* (Vespidæ) from Abyssinia and Eritrea, *Belonogaster griseus menelikii* (Vespidæ) from Abyssinia, Eritrea, Somaliland, and South Arabia; the two latter are examples of geographical races replacing the typical form of a species widespread in the Ethiopian Region.

Otherwise the forms represented are mostly more or less widely distributed in the part of the African continent within the Ethiopian Region, especially on its eastern side *. In some cases (*Eumenes maxillosus*, *Polistes marginalis*) the range is even wider, including Southern Arabia.

Although the records of *Trielis aliena* (Scoliidæ), *Celonites jousseaumei* (Masaridæ), and the ant *Camponotus maculatus ægyptiacus* are included, the specimens were taken near sea-level in French Somaliland (and, in the case of the ant, also at a low altitude in Abyssinia). Probably these species will be found to have no place in the fauna of the highlands.

Bionomic Notes.—See under Formicidæ, where such notes are summarized in an introductory paragraph; and, under Vespidæ, a note on the adherence of pollinia of Asclepiadaceæ to the tarsi of *Polistes marginalis*.

Supplementary Records.—At the end of Vespidæ is appended a list of species of that family, not obtained by my Expedition, of which the British Museum Collection includes specimens from Abyssinia.

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* The Scoliid *Campsomeris dispilus*, first discovered at altitudes between 3000 and 4000 feet in Kilimanjaro, is now recorded from between 5000 and 6000 feet, north of Lake Zwai.

Material.—A first set of the whole material is in the British Museum.

Approximate Situation of Localities mentioned.

Addis Ababa, 9° N., 38° 45′ E.

Addis Alam, about 20 miles west of Addis Ababa.

Addas, roughly 25 miles south-east of Addis Ababa, close to the railway.

Alaba (a name attached to specimens collected by R. J. Stordy in 1911), doubtful, possibly a district south of Lake Shala.

Chillálo, Mt., the westernmost of the high Arussi Mts., immediately east of Lake Zwai, about 7° 55′ N., 39° 10′ E., and about 80 miles south-east of Addis Ababa.

Das (Stordy, 1911), position uncertain.

Doukam, about 25 miles south-east of Addis Ababa, the name of a river and a station on the railway.

Gatelo Amaiyu (Stordy, 1911), probably east of south end of Lake Abaya [Margherita].

Harar, 9° 25′ N., 42° 5′ E.

Hawash railway-station, about 9° N., 40° 8′ E.

Higo Samula (Stordy, 1911), probably east of south end of Lake Abaya [Margherita].

Hora Abjata, Lake, the more western of the two lakes south of Lake Zwai.

Hora Harsadi, one of the group of small lakes at Addas, *q. v.*

Jem-Jem [or Djem-Djem] Forest, about 45 miles from Addis Ababa, nearly due west.

Maraquo (a name attached to many specimens collected by Kovacs in 1914), doubtful.

Muger River, a tributary of the Abbai (Blue Nile); the part visited is about 30 miles from Addis Ababa, west of north.

Mulu, Lt.-Col. D. A. Sandford's farm on the edge of the deep chasm in which the Muger flows.

Sucsuci River, connecting Lakes Zwai and Hora Abjata.

Wachacha ravine, a few miles from Addis Ababa, a little south of west.

Wambar Mariam, a village at the foot of the north side of Mt. Zukwala, *q. v.*

Wouramboulchi, some miles west of Jem-Jem Forest.
Zukwala, Mt. [or Zuquala, Zaquala, etc.], about 8° 31′ N., 38° 50′ E., nearly 40 miles from Addis Ababa, east of south.
Zwai, Lake, about 8° N., 38° 45′ E., over 60 miles south of Addis Ababa.

Tenthredinidæ. By ROBERT B. BENSON.

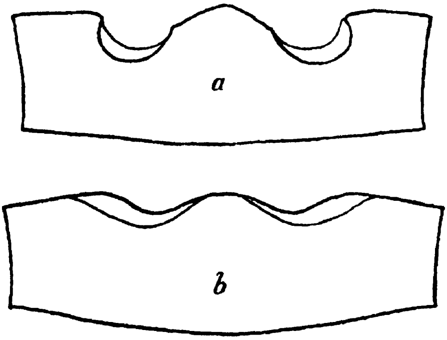
Though a special search was made for sawflies, only four specimens, representing a single species, were collected. The specimens proved to belong to a species represented in the British Museum by material collected in the Harar district of Abyssinia by Kristensen, and, up till now, confused with *Athalia vollenhoveni* Gribodo, with which it is very closely allied. Through the kindness of Dr. Walther Horn, who has lent me the specimens of African *Athalia* in Konow's collection at the Deutsches Entomologisches Institut, I find that the Abyssinian species is conspecific with the type of *A. schweinfurthi* Konow, described in 1891 from a female specimen collected by Dr. Schweinfurth at Chibam, in Hadramaut, Southern Arabia. In the 'Genera Insectorum,' 1905, Konow placed *A. schweinfurthi* as a synonym of *A. vollenhoveni,* but the two species are really distinct; they are most easily separated by the much greater length of the malar space in both sexes of *A. schweinfurthi,* and by the shape of the hypopygium in the females. The following is a redescription of the female sex of *A. schweinfurthi* from several examples, with a description of the male sex for the first time.

Athalia schweinfurthi Konow.

Athalia schweinfurthi Konow, Wien. Ent. Zeit. x. p. 41, 1891.
Athalia vollenhoveni Gribodo, Konow, Gen. Ins., fascic. 29 (Tenthredinidæ), p. 94, 1905.

♂♀.—*Colour.* Yellow; black or fuscous are:—the head with all its appendages, the thorax, the tibial and tarsal segments distally, together with the coxæ and trochanters of all the legs, the tergum and sternum of the first abdominal segment, and the saw-sheath; wings yellowish-hyaline; stigma and costal area black.

Head and *thorax* pubescent, with brown hairs on vertex of head and dorsum of thorax, with white hairs elsewhere, unpunctured except for the hair-follicles; clypeus with the front margin deeply and roundly emarginate; eyes separated from the clypeus by a comparatively long malar space, about 0·2 mm. in female examples and about 0·12 mm. in males *; median fovea and frontal furrow obsolete; antennæ 9-segmented, though segment 9 is evidently made up of two completely fused segments; 3 less than 4+5; 9 equals 8+7; no segment of flagellum broader than long; legs with simple claws. *Abdomen* with terga 2–8 glabrous dorsally; terga 2–8 with their ventral portions, together with tergum 1, the apical terga, all the sterna, and the saw-sheath, pubescent;



Hypopygium of ♀ viewed from beneath (pubescence etc. omitted).
a, Athalia vollenhoveni; *b, A. schweinfurthi.*

♀ hypopygium (fig. *b*); ♂ hypopygium with the hind margin roundly emarginate in the middle and also at the extreme sides; ♀ saw of the type usual in the genus †, but differing from that of *A. vollenhoveni* in having finer and more numerous denticulations, the tenth tooth from the apex having about ten and thirty denticulations on its two sides, whereas in *A. vollenhoveni* it has about eight and fifteen; the pubescence on the inner surface of both these saws is almost entirely absent, and where present is directed towards the teeth; on the outer surface the pubescence is normal and directed towards the base of the saw, and it shows greater development and abundance in this species than in *A. vollenhoveni*.

Length 7·5–9·5 mm.

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* In *Athalia vollenhoveni* these measurements are respectively 0·16 mm. and 0·08 mm.

† See fig. 1 in Benson, "Parallel Variation in *Athalia lugens* Klug and *A. cordata* Lep.," Ann. & Mag. Nat. Hist. (10) ix. pp. 183–8, 1932.

Loc. Abyssinia: between Jem-Jem and Addis Ababa, 7000–8000 ft., 11–14. x. 1926, 2 ♀, "on wild Umbelliferæ" (*Scott*); Wouramboulchi, ca. 9000 ft., 4–7. x. 1926, 2 ♀ (*Omer-Cooper*); Harar district, 2 ♂ (allotype and paratype), 8 ♀ (*Kristensen*). Eritrea: Asmara, vii., 1 ♀ (in Coll. Konow). South Arabia: Hadramaut, Chibam, 1 ♀ (*Schweinfurth*, in Coll. Konow).

It is probable that the sawfly fauna of Abyssinia is very sparse. Nevertheless, I have myself examined representatives of a few other species of *Athalia* from Abyssinia and the highlands of Eritrea:

Athalia himantopus Klug. Abyssinia: Harar district, 4 ♂ (*Kristensen*, in Brit. Mus.). Eritrea: Asmara, vii., 1 ♂ (in Coll. Konow). This species is widely distributed over the African continent.

A. abyssinica Forsius. Abyssinia: described from 2 ♀ taken in the Harar district (*Kristensen*, 1 ♀ paratype in Brit. Mus.).

A. fumosa Gribodo. Eritrea: Asmara, vii., 1 ♂ (in Coll. Konow).

A. ? sp. Eritrea: Asmara, vii., 1 ♂ (in Coll. Konow).

In addition to these *A. similis* Mocsáry was described from material taken in Eritrea, but I have not been able to see the type.

Formicidæ. By HUGH SCOTT.

The ants were submitted, shortly after the return of the Expedition in 1927, to Mr. W. C. Crawley, who named a number of species. Being unable to complete the task, he sent back the material in 1930, and the working out of the collection was completed at the British Museum by Mr. Donisthorpe. In the meantime, however, Mr. Crawley had sent a few specimens of certain species to Dr. F. Santschi, by whom two of the new species were described.

Nineteen species, some of them represented by two subspecies, were obtained. They represent thirteen genera and five subfamilies. Four new species have been described—*Monomorium crawleyi* and *Camponotus Coderatus* by Santschi in 1930, *Tetraponera scotti* and *mamponotus ligea* by Donisthorpe in 1931. Three species, represented only by male examples, must remain undetermined. The remainder must be regarded as determined by Crawley and Donisthorpe, or by the latter alone, excepting *Pachycondyla crassa* and *Camponotus thraso assabensis*, specimens of which were determined by Santschi.

The general distribution of the various forms has been extracted from W. M. Wheeler's "Synonymic List of the Ants of the Ethiopian Region" (being Section VIII of "Ants of the American Museum Congo Expedition"), Bull. Amer. Mus. Nat. Hist. xlv. pp. 711–1004, 1922. Their affinities are mainly Ethiopian, some of the species and even some of the subspecies being very widely distributed in that Region, but in some cases the particular subspecies or variety is only recorded as more or less widely distributed on the eastern side of Africa; the four new species, of course, are so far recorded only from Abyssinia, and the same applies to *Camponotus carbo honorus*, while *Solenopsis punctaticeps erythræa* and *Camponotus thraso assabensis* are recorded only from Abyssinia and Eritrea. *Messor barbarus* var. *galla*, which is widely distributed across Tropical Africa, is interesting in that its range extends into Southern Arabia.

The bionomic notes under the species show that specimens of *Pachycondyla crassa*, *Pheidole megacephala ilgi*, and *Camponotus ligea* were found in company with certain Pselaphid beetles, the determinations of which, as nearly as possible, are given below; and examples of *Camponotus carbo honorus* in company with two named species of Staphylinidæ. A heteropterous bug and a brachypterous midge (*Peyerimhoffia*) were found under a stone among workers of *Acantholepis capensis*. Workers of the latter species were found in company with aphids on aloe flowers. Specimens of *Pheidole megacephala ilgi* (☿), *Crematogaster neuvillei* (♀), *Monomorium crawleyi* (many ☿), and *Camponotus moderatus* (♀, ☿, ♃) were all found together in the much decayed dead parts of a tree-Euphorbia (*Euphorbia abyssinica*) in Jem-Jem Forest. Workers of *Crematogaster neuvillei* were also found, in some numbers, beneath the loose bark of a mimosa from which a resinous fluid was running. Male examples of *Dorylus affinis ægyptiacus*, *Leptogenys* sp., and *Camponotus maculatus ægyptiacus* were captured at artificial light.

Dorylinæ.

Dorylus (*Dorylus*) *affinis* Shuck., var. *ægyptiacus* Mayr. (var. *abyssinicus* Emery).

Loc. Abyssinia: Addis Ababa, 4. ix. 1926, 1 ♂, flew to light (*Scott*); Jem-Jem Forest, 8000–9000 ft., 29. ix.–4. x. 1926, 1 ♂ (*Scott*).

The variety *ægyptiacus* is recorded from Egypt, Sudan, Eritrea, Abyssinia, and East Africa.

Dorylus (*Anomma*) *nigricans* Ill., subsp. *burmeisteri* Shuck., var. *molestus* Gerst.

Loc. Abyssinia: Wouramboulchi, ca. 9000 ft., 4–7. x. 1926, 1 ♂ (*Omer-Cooper*); Muger River, ca. 5500 ft., 28–29. xii. 1926, 1 ♂ (*Scott*); cultivated country near Addis Alam, ca. 8000 ft., 18–19. ix. 1926, several ☿ and ♃ (*Scott*); Jem-Jem Forest, 8000–9000 ft., 20. ix. 1926, long series of ☿ and ♃.

The variety *molestus* is recorded from many parts of Eastern Africa, from Abyssinia to Portuguese East Africa.

Dorylus (*Rhogmus*) *fimbriatus* Shuck.

Loc. Abyssinia: at a small river south of Mt. Zukwala, ca. 6000 ft., 31. x. 1926, 1 ♂ (*Omer-Cooper*).

Widely distributed in Tropical Africa, west as well as east.

Ponerinæ.

Pachycondyla (*Bothroponera*) *crassa* Emery.

Loc. Abyssinia: near Addis Alam, 7000–8000 ft., 20. ix. 1926, 1 ☿ (*Scott*); it was found under a stone in company with a Pselaphid beetle, determined by Mr. G. E. Bryant as *Centrophthalmus* sp. near *armatus* Raffray.

Originally described from Abyssinia, this ant is recorded from Eritrea, Somaliland, East Africa, and the Congo.

A species of *Euponera* (*Trachymesopus*), represented by a single ♂ from the Muger Valley, ca. 5500 ft., xii. 1926, and a species of *Leptogenys*, also represented by a single ♂, which flew to light at the Hawash railway station, ca. 3500 ft., 2. ix. 1926, must be left undetermined in the absence of further material.

Pseudomyrminæ.

Tetraponera scotti Donisthorpe, Ann. & Mag. Nat. Hist. (10) viii. p. 498, 1931.

This species was described from the material collected by the Expedition; the specimens consisted of one deälated ♀ *minus* its antennæ, and the head of a ☿, found clasped in the legs of the ♀. How the body of the ☿ was detached and lost cannot now be recalled.

Loc. Abyssinia: Jem-Jem Forest, 8000–9000 ft., 21–30. ix. 1926 (*Scott*).

Myrmicinæ.

Messor barbarus L., var. *galla* Emery.

Loc. Abyssinia: Wachacha ravine, near Addis Ababa, ca. 8000 ft., 9. ix. 1926, several ♃, from native scrub (*Scott*); Sucsuci River (connecting Lakes Zwai and Hora Abjata), 12. xi. 1926, long series of ☿ and ♃ (*Omer-Cooper*).

The variety *galla*, originally described from Abyssinia, is now known right across Tropical Africa from Senegambia to the Sudan, Eritrea, Somaliland, and Eastern Africa as far south as Tanganyika Territory. It has recently been recorded from Southern Arabia, where Mr. Bertram Thomas discovered several ♃ in the Qara Mts. at 1750 ft. (see 'The Geographical Journal,' lxxviii. p. 234, Sept. 1931, and 'Arabia Felix,' Appendix ii. J, pp. 361, 362, 1932).

Pheidole megacephala F., subsp. *ilgi* Forel.

Loc. Abyssinia: Jem-Jem Forest, ca. 8000 ft., 22. ix. 1926, 2 ♃ (*Scott*); same locality, 25. ix., 4 ♃, 2 ☿ (*Omer-Cooper*), taken under bark in company with two species of Pselaphidæ, determined by Mr. G. E. Bryant as *Batrisodes* sp. near *caudatus* Raffray, and *Raffrayia* sp. near *antennata* Raffray; same locality, 26. ix., 1 ☿ from much decayed dead parts of a tree-Euphorbia (*Scott*).

This subspecies of an almost cosmopolitan species is recorded from Abyssinia, East Africa, Rhodesia, and the Belgian Congo.

Crematogaster (*Acrocœlia*) *neuvillei* Forel.

Loc. Abyssinia: between Addis Alam and Jem-Jem, 7000–8000 ft., 20. ix. 1926, several ☿ from under bark of a growing mimosa, from which resin was bleeding (*Scott*); Jem-Jem Forest, ca. 8000 ft., 25. x., several ☿ (*Omer-Cooper*); same locality, 26. ix., deälated ♀, from much decayed dead parts of a tree-Euphoria (*Scott*).

The typical form of this species appear to be recorded only from Abyssinia, but certain varieties from South Africa.

Monomorium crawleyi Santschi, Ann. Soc. ent. Belg. lxx. p. 66, 1930.

This species is based on material collected by the Expedition, two out of a long series of ☿ having been submitted by Crawley to Santschi. The type has since been returned by Santschi and is, with many paratypes, in the British Museum.

Loc. Abyssinia : Jem-Jem Forest, ca. 8000 ft., 26. ix. 1926, from dead parts of a tree-Euphorbia, over 40 ☿ (*Scott*).

Solenopsis punctaticeps Mayr, subsp. *erythræa* Emery.

Loc. Abyssinia : Jem-Jem Forest, ca. 8000 ft., from river-bed, 2. x. 1926, 1 ☿ (*Scott*) ; Mulu, above the Muger Valley, ca. 8000 ft., 23. xii. 1926, 2 deälated ♀ and about 50 ☿, found under a stone (*Scott*).

The species is widely distributed in Tropical and South Africa, but the subspecies *erythræa* appears so far to have been recorded only from Eritrea.

Rhoptromyrmex sp. 3 ♂ from a marsh near Lake Hora Abjata, ca. 5000 ft., 18. xi. 1926 (*Omer-Cooper*), must remain undetermined in the absence of ☿ or ♀. In Wheeler's ‘ Synonymic List of the Ants of the Ethiopian Region ’ (1922) no member of the genus is recorded from Abyssinia.

Formicinæ.

Acantholepis capensis Mayr.

A large number of ☿ of this species (which is very widely distributed in Tropical Africa) was collected, in several different places. One of the series from beneath a stone at Lake Hora Harsadi was determined by Crawley as subsp. *canescens* Emery, which is nearly as widely distributed as the typical form ; and the series from spikes of aloe-blossom near the Hawash River was determined (also by Crawley) as possibly subsp. *depilis* Emery, a form apparently recorded only from Somaliland and Abyssinia. But no attempt has been made to discriminate subspecies or varieties among the other series of specimens.

Loc. Abyssinia: between Addis Alam and Jem-Jem, 7000–8000 ft., 20. ix. 1926, several ☿, swept in a grass field (*Omer-Cooper*); Doukam, 6500–7000 ft., 19. x., 1 ☿, shaken from flowers of *wanza* tree (*Cordia abyssinica*) (*Scott*); near the Hawash River, west of Mt. Zukwala, ca. 6000 ft., 30. x., about 47 ☿ (*Scott*), taken from flower-spikes of an aloe (*Aloe percrassa* Todaro), in company with *Aphis gossypii* Glover (F. Laing det.); shores of Lake Hora Harsadi, Addas, ca. 7000 ft., 2–4. xii., several series of ☿ from beneath stones, a Heteropterous bug [*] and a short-winged midge (Sciarinæ, ? *Peyerimhoffia* sp. ♀) being taken in company with one of the series (*Scott, Omer-Cooper*).

Camponotus (*Myrmotrema*) *carbo* Emery, subsp. *honorus* Forel.

Loc. Abyssinia: Jem-Jem Forest, ca. 8000 ft., 25. ix. 1926, about 14 ☿ (*Omer-Cooper*); same locality, 29. ix., 2 ☿ beaten out of a nest in a dead branch, in company with two species of Staphylinidæ (*Medon abessinus* Bernh. and *Atheta* sp., probably *A. euphorbiæ* Bernh.), neither of them exclusively restricted to ants'-nests (see Scott, Journ. Linn. Soc., Zool. xxxvii. p. 564, 1931).

The subspecies *honorus* has previously been recorded from Western Abyssinia.

Camponotus (*Paramyrmamblys*) *moderatus* Santschi, Ann. Soc. ent. Belg. lxx. p. 76, 1930.

This species is based on material collected by the Expedition, 1 ☿ (the type) having been submitted to Santschi by Crawley. The type has since been returned and is, with other specimens, in the British Museum.

Loc. Abyssinia: Jem-Jem Forest, ca. 8000 ft., 26. ix. 1926, 1 ♀ (deälated), 2 ☿, 1 ♃, from much decayed dead parts of a tree-Euphorbia (*Scott*).

[*] This was almost certainly a Pyrrhocorid, *Scantius* sp., one example, but owing to an omission in recording data I cannot be quite sure.

Camponotus (*Tanæmyrmex*) *ligea* Donisthorpe, Ann. & Mag. Nat. Hist. (10) viii. p. 500, 1931.

Described from the material collected by the Expedition.

Loc. Abyssinia : Mt. Chillálo, ca. 9000 ft., 12. xi. 1926, 1 ☿ major and 3 ☿ minors (*Scott*); they were taken from a nest in a rotten tree-trunk, in company with three examples of a Pselaphid beetle, determined by Mr. G. E. Bryant as *Batrisodes*, sp. n.

Camponotus (*Tanæmyrmex*) *maculatus* F., subsp. *ægyptiacus* Emery.

Loc. French Somaliland : Jibuti, 29–31. viii. 1926, 1 ♂, flew to light (*Omer-Cooper*). Abyssinia : Hawash railway station, ca. 3500 ft., 2. ix., 1 ♂, flew to light (*Omer-Cooper*).

The only examples of this subspecies collected were taken respectively at sea-level and at a comparatively low altitude. The subspecies is recorded from Egypt and Eritrea.

Camponotus (*Tanæmyrmex*) *maculatus* F., subsp. *pulvinatus* Mayr.

Loc. Abyssinia : Jem-Jem Forest, ca. 8000 ft., 20. ix. 1926, 1 ☿ (*Omer-Cooper*).

The species *maculatus*, in its many forms, is very widely distributed in Tropical Africa, occurring also in Southern Arabia, Socotra, Madagascar, and certain of the islands of the Western Indian Ocean. The subspecies *pulvinatus* has been recorded from East Africa and Uganda.

Camponotus (*Tanæmyrmex*) *thraso* Forel, var. *assabensis* Emery.

Workers submitted to Dr. Santschi were returned labelled "*Camponotus thraso* Forel, var. *assabensis* Emery." The variety *assabensis* was originally described (1893) by Emery as a variety of *Camponotus maculatus* subsp. *adenensis* Emery, a status which was retained for it by Wheeler in his 'Synonymic List of the Ants of the Ethiopian Region' (1922, p. 952), while Emery, on the other hand, has later (Gen. Ins., fascic. clxxxiii. 1925,

p. 92) treated it as a variety of *thraso*, a species which (under numerous subspecific forms) is recorded from Ceylon and from many parts of the Ethiopian Region. In any case, the occurrence, on the tops of the highest mountains visited, of a form previously recorded (but without mention of altitude) only from Assab, in South-Eastern Eritrea, near the Red Sea coast, is of some interest. The specimens were collected at higher altitudes than any other ants obtained by the Expedition, and the deälated queen from Mt. Chillálo was found at the highest point reached during the whole journey.

Loc. Abyssinia : Mt. Zukwala, ca. 9000 ft., 21–26. x. 1926, 7 ☿, including one specimen which is unusually large but not definitely ♃ (*Scott* and *Omer-Cooper*) ; Mt. Chillálo, high moorland, 12,000–13,000 ft., 18. xi. 1926, 1 deälated ♀ (*Scott*).

Mutillidæ. By HUGH SCOTT.

Dr. H. Bischoff has kindly determined as nearly as possible the few examples of this family collected. The references given are to his "Monographie der Mutilliden Afrikas," Arch. Naturg. lxxxvi. Abt. A, Heft. 1–5, 1920.

Glossoptila sp.

Loc. Abyssinia : Muger Valley, ca. 5500 ft., 28–29. xii. 1926, 1 ♂, from herbage in the river-bed (*Scott*).

This specimen belongs to a species, possibly undescribed, which is related to, but distinct from, *G. adustæformis* Bisch. (*op. cit.* p. 484), recorded from Asmara, Eritrea.

Mimecomutilla djibutina Bischoff, *op. cit.* p. 500.

Loc. Abyssinia : between Hawash R. and the lakes of Addas, 6000–7000 ft., 28–30. xi. 1926, 1 ♀ (*Omer-Cooper*). Previously recorded from the *hinterland* of Jibuti and from the Harar district. A distinct subspecies was also described by Bischoff from Kilimanjaro.

Ctenotilla thoracosulcata Magr. 1906, subsp. affin. *samharica* Magr., 1905 ; Bischoff, *op. cit.* pp. 544, 545.

Loc. Abyssinia : Mt. Chillálo, Digalla, ca. 9500 ft., 27. xi. 1926, 1 ♀ (*Scott*). Both the type-form and the subspecies *samharica* (to which the specimen recorded is akin) are recorded from various parts of Eritrea.

Scoliidæ. By HUGH SCOTT.

Myzine kristenseni Turner, Trans. Ent. Soc. London, 1912, p. 734, Feb. 1913.

Loc. Abyssinia: Harar, 1 ♂ (*Kristensen*); plains north of Lake Zwai, 5500–6000 ft., 3–4. xi. 1926, 1 ♂ (*Scott*).

This species was described from the ♂ collected at Harar, and the ♂ collected near Lake Zwai was determined by Turner, many years afterwards, in 1931. The second ♂ is considerably smaller than the type, and lacks the two yellowish marks on the front margin of the pronotum, but it has the three yellowish-white marks on the hind margins of each of the abdominal segments 2–6, and in other characters also agrees with the type.

Trielis aliena Klug.

Loc. French Somaliland: Ambouli Oasis, near Jibuti, 29. i. 1927, 1 ♂ (*Scott*). Recorded from Egypt, Eritrea, Abyssinia, and Arabia.

The single example was determined by R. E. Turner in 1931. It is included here, as the record may be useful, but probably the species forms no part of the fauna of the Abyssinian highlands.

Campsomeris dispilus (Cameron).

Dielis dispilus Cameron, in Sjöstedt, Zool. Kilimandjaro–Meru Exped. ii. Abt. 8, p. 230, 1910.

Loc. Abyssinia: plains north of Lake Zwai, 5500–6000 ft., 3–4. xi. 1926, 2 ♂ (*Scott*). The type-locality is Kilimanjaro, Kibonoto, ca. 3200–4200 ft. (1000–1300 m.).

These two specimens were determined by J. Chester Bradley.

Campsomeris sp.

5 ♂, obtained at the same place and time as the preceding, have been provisionally placed by Chester Bradley near *fasciatella* Klug (a species recorded from North and East Africa).

Note.—The genus *Myzine* is included in SCOLIIDÆ above, though, according to some schemes of classification, it should be placed under a separate family, TIPHIIDÆ. Six other specimens of TIPHIIDÆ obtained by the

Expedition must remain undetermined for the present, as no expert has been found to undertake this small material. The same remarks apply to six examples of BETHYLIDÆ.

CHRYSIDIDÆ are represented by only one specimen, *Chrysis* (*Tetrachrysis*) sp. (Jem-Jem Forest, nearly 9000 ft., 24. ix. 1926, *Scott*), possibly referable to *C.* (*T*). *viridissima* Klug, though the four teeth at the apex of the third segment of the abdomen are considerably sharper and more produced than in the examples placed under that species in the British Museum, which include several from Abyssinia (Harar). In my specimen also the punctures of the ante-apical series on the third segment are few, irregular, large and deep, and they lie in an impressed groove (only interrupted narrowly in the middle line) which, in some aspects, makes the segment appear divided into two. (*C. viridissima* is recorded from Egypt and Shoa.)

Masaridæ*. By A. v. SCHULTHESS.

Celonites jousseaumei du Buysson, Rev. d'Ent. xxv. p. 104, 1906.

The single specimen obtained has been determined by comparison with a typical example from the Paris Museum, kindly sent on loan by Mons. L. Berland. Unfortunately the loaned example is ♀, while that collected by the 1926–7 Expedition is ♂; as, judging by the original description, it appears to deviate from typical ♂ specimens in some small points, the following description of it is added :—

♂.—Black and ferruginous-red, with yellowish-white markings. The following parts are black: mandibles, labrum, head, antennæ (except segments 3–6 of the flagellum, which are yellowish on the dorsal side), mesothorax, middle part of scutellum, propodeum, trochanters, femora, and abdominal sternites 3–6. The following are ferruginous-red: pronotum, front part of tegulæ, hind border of scutellum, postscutellum, some dots on the mesopleuræ and on the sides of the propodeum, the dorsal surface of the abdomen, sternites 1 and 2, and the tarsi. The following are yellowish white: the clypeus (excepting a black border round it), an M-shaped mark on the frons, filling the incision in the eye-margin on either side, the front angles and the hind margin of the pronotum, the white band along the latter being enlarged in the median part and emarginate in the middle in front, the hind part of the tegulæ, the parategulæ, a dot on the dorsulum just before the scutellum, a large dot on the front part of the mesopleura on each side, just below the roots of the wings, two large dots on the lateral parts of the scutellum (just inside the ferruginous border), the scales forming the upper hind angles of the propodeum, a rather large band (bisinuate in front) on the first tergite, a median and (on either side) a lateral spot on each of tergites 2–6; on the last tergite there is only a central spot. Tibiæ yellow. Wings rather smoky. Length 6 mm.

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* This group is treated by some writers as a subfamily of Vespidæ, but is here kept separate, a more convenient arrangement in the present paper, since the single species has been examined by a different author.

In sculpture and structure there is virtually no difference from typical *C. jousseaumei.* Clypeus as long as broad, shining, very sparsely but deeply punctured. The only structural difference between the ♂ and ♀ before me, probably a sexual difference, is the greater distance, in the ♂, between the eye and the posterior ocellus. In the ♂ sex, the last tergite was originally described as "très largement arrondi, subtransversal au milieu, avec un très petit angle de chaque côté"; in the ♂ example before me it is constructed thus, only the lateral angles are rather large and broad. In this example also the sternites bear bristly hairs on their hind borders, the last sternite has a central and on each side a lateral dentiform prolongation, and the antennæ have three tyloids.

Loc. French Somaliland: Ambouli Oasis, near Jibuti, 29. i. 1927, 1 ♂ (*Scott*). The localities given in the original description were Obok, Jibuti, and Tajura, all on the French Somali Coast.

Vespidæ. By J. Bequaert.

For bibliographical references to the species listed below the student is referred to the "Bibliographic and Synonymic Catalogue of the Ethiopian Vespidæ," appended to my "Revision of the Vespidæ of the Belgian Congo," Bull. Amer. Mus. Nat. Hist. xxxix. pp. 266–350, 1918.

Eumenes maxillosus (Degeer).

Loc. Abyssinia: Doukam, 6500 to 7000 ft., 19. x. 1926, 1 ♀ (*Scott*); Jem-Jem Forest, ca. 8000 ft., 7–9. x. 1926, 1 ♀ (*Scott*); Higo Samula, 30. x. 1911, 2 ♀ (*Stordy*); Alaba, 15. xi. 1911, 2 ♀ (*Stordy*).

All the above specimens belong to the typical colour-phase of the species, which occurs all over the Ethiopian Region, in South-West Arabia, and Madagascar, and which I have discussed in 1926 (Ann. South Afr. Mus. xxiii. 3, pp. 559–567) and 1928 (Ann. & Mag. Nat. Hist. (10) ii. pp. 166–167). It should be noted that only *savignyi*, *reginus*, *dimidiatipennis*, *conicus*, *fenestralis*, and *tropicalis* are colour-phases of *E. maxillosus*. The other forms, which I had connected formerly with this species, are really varieties of *E. pyriformis* (F.), a quite distinct species of the Oriental Region *.

Eumenes melanosoma Sauss.

Loc. Abyssinia: Jem-Jem Forest, ca. 8000 ft., 7–9. x. 1926, 1 ♀ (*Scott*).

This specimen belongs to the typical colour-phase of the species, which is widely distributed in Tropical and South Africa.

Eumenes lucasius Sauss.

Loc. Abyssinia: Wachacha ravine, near Addis Ababa, ca. 8000 ft., 9. ix. 1926, 1 ♂ (*Scott*); Higo Samula, 30. x. 1911, 1 ♂ (*Stordy*).

Widely distributed in East and South Africa, from Abyssinia to the Cape.

Odynerus (*Rygchium*) *tropicalis* Sauss.

Loc. Abyssinia: Wambar Mariam, on lower slopes of Mount Zukwala, ca. 7000 ft., 28. x. 1926, from dry grass,

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* There are in the British Museum several ♂ examples from Abyssinia (Addis Ababa and Hawash, *Stordy*) of a colour-form of this species in which the second to fifth tergites are more or less conspicuously marked with pale yellowish at the base; the clypeus is reddish, or, in one case, pale yellow with a dark median stripe down the basal half; there are slight reddish marks on the head, immediately above the eyes, and between the bases of the antennæ; otherwise the general colouring is black.—H. S.

2 ♀ (*Scott*); Alaba, 15. xi. 1911, 2 ♀ (*Stordy*); Higo Samula, 30. x. 1911, 1 ♂ (*Stordy*); Harar, 1 ♂ (*Kristensen*) *.

The specimens from Alaba and Harar had been previously named by G. Meade-Waldo, and those from Mt. Zukwala by R. E. Turner. Dr. Scott also sent for comparison specimens in the British Museum from Pretoria, Transvaal; Mwera, Uganda; and Boonso, Gold Coast, all named *O. tropicalis* by G. Meade-Waldo.

This is perhaps the most common African species of *Odynerus*, apparently distributed over the entire Ethiopian Region, from sea-level to an altitude of about 7000 ft. I have seen over 120 specimens from the French Sudan (Djenné on the Senegal River), Liberia, the Gold Coast, Cameroon, the French Congo, the Belgian Congo, Uganda, Abyssinia, and Transvaal. *O. tropicalis* was originally described from Abyssinia.

Odynerus (*Rygchium*) *silaos* Sauss., var. *asmarensis* Schulth.

Loc. Abyssinia: Mount Zukwala, ca. 9000 ft., 21–25. x. 1926, 1 ♀ (*Scott*); Higo Samula, 30. x. 1911, 1 ♀ (*Stordy*); Addis Ababa, 3 ♀ (*Stordy*); Harar, 6 ♂, 1 ♀ (*Kristensen*). The typical form † of this species is recorded from Abyssinia, East and South Africa, and Madagascar.

The specimens from Harar, Addis Ababa, and Higo Samula were previously named by G. Meade-Waldo, and that from Mt. Zukwala by R. E. Turner.

I have compared these specimens with a female "co-type" (really a paratype), from Asmara, Eritrea, at the British Museum, kindly sent by Dr. Scott. Originally *asmarensis* was described as a variety of *O. silaos* Sauss. (*O. silaensis* Sauss.). In 1915 (Trans. Ent. Soc. London (1914), iii.–iv. p. 507) G. Meade-Waldo claimed that it was "quite distinct," but pointed out differences in colour only. After a careful comparison of South African specimens of typical *O. silaos* with *asmarensis* from Eritrea and Abyssinia, I am unable to find structural or sculptural differences between these two forms.

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* The British Museum has about eight other examples from Harar (*Kristensen*), not submitted to Dr. Bequaert.—H. S.

† No examples of the typical form of this species were obtained by my Expedition, but the British Museum has Abyssinian specimens (named by G. Meade-Waldo) collected by Stordy at Addis Ababa and Higo Samula.—H. S.

Like *O. tropicalis*, *O. silaos* and its variety *asmarensis* bear brushes of glistening hairs on the middle of the fourth, fifth, and sixth abdominal sternites of the male.

Ancistrocerus zebra (Sauss.).

Loc. Wachacha ravine, near Addis Ababa, ca. 8000 ft., 9. ix. 1926, 1 ♀ (*Scott*); M. Zukwala, ca. 9000 ft., 21–25. x. 1926, 1 ♂ (*Omer-Cooper*); Mt. Chillálo, moorland, ca. 10,000 ft., 17–19. xi. 1926, 1 ♀ (*Scott*); Addis Ababa, 1 ♀ (*Stordy*); Harar, 1 ♂, 1 ♀ (*Kristensen*). This species is only recorded from Abyssinia, the type-locality being Simen.

The specimens from Harar and Addis Ababa had been named previously by G. Meade-Waldo, and that from Wachacha by R. E. Turner.

These specimens are all structurally alike and show only minor differences in colour. In all the pale markings are ivory-white, not yellow as stated by de Saussure. In both males the clypeus is wholly ivory-white. Of the females, those from Harar, Addis Ababa, and Wachacha have the clypeus black, with an arcuate, basal, ivory-white band (interrupted in the middle in the specimen from Wachacha); in the third female, from Mt. Chillálo, the clypeus is entirely black.

In a former paper (1918) I suggested that *A. neavei* (Meade-Waldo) was perhaps only a colour-variant of *A. zebra*. I have now carefully compared both sexes of these two species, and have reached the conclusion that, although undoubtedly related, they are structurally distinct. *A. neavei* is more slender than *A. zebra*, the difference being especially noticeable in the first abdominal segment; the dorsal area of the first tergite (behind the transverse ridge) of *A. zebra* is nearly twice as wide as long in the middle; while in *A. neavei* it is hardly more than 1¼ times as wide. The second abdominal segment is much more swollen, both dorsally and ventrally, in *A. neavei* than in *A. zebra*, the second tergite of *A. neavei* being strongly humped in the middle behind the basal articulation. The basal slope of the second sternite is also much steeper and longer in *A. neavei* than in *A. zebra*.

The colour-markings also appear to be of a different type in these two species. In *A. zebra* the pale markings are ivory-white and form apical fasciæ on the first four or five tergites; ventrally these fasciæ vary in number from one to five. In nine males and two females of *A. neavei* the pale markings are much more yellowish, and form apical fasciæ on the first and second tergites and on the second sternite only.

A. zebra is the Abyssinian representative of the subgenus *Ancistrocerus* proper, which is essentially a Palæarctic and Nearctic group (see Bequaert, Trans. Amer. Ent. Soc. li. pp. 60 & 65, 1925). In the Ethiopian Region it is represented by the few species listed below, some of which may be synonyms:—

1. *A. capensis* (Sauss.), described from South Africa.
2. *A. lineaticollis* Cameron, from Mt. Meru, at 3500 m. (ca. 11,400 ft.).
3. *A. neavei* (Meade-Waldo), common in the Ruwenzori Range, from 1600 to 8500 ft. I have also taken it in the Kivu Highlands (Rutshuru, 4000 ft.; Burunga, 5900 ft.; and Rueru, on the south-western slope of Mt. Mikeno, 9500 ft.). There is at the Congo Museum, Tervueren, a female of this species labelled "Beni," but I suspect that it was actually taken to the west of that place, in the foothills of Mt. Ruwenzori.
4. *A. neuvillei* (du Buysson), described from the Escarpment of Kenya Colony.
5. *A. striativentris* (Cameron), described from Mt. Kilimanjaro (Kibosho, 3000 to 4000 m., or ca. 9800 to 13,000 ft.).
6. *A. zebra* (Sauss.), originally described from Simen and Shoa, in Abyssinia. According to Scott's findings this species reaches altitudes as much as 10,000 ft.

These African wasps are of much interest to the zoogeographer, since they are one of the best examples of Palæarctic faunal types that have invaded the highlands of the Ethiopian Region in the eastern half of the continent, some of them eventually reaching Souht Africa.

Belonogaster griseus **Fabr., var.** ***menelikii*** **Gribodo.**

Loc. Mt. Zukwala, ca. 9000 ft., 24–25. x. 1926, 1 ♀ (*Omer-Cooper*); Mt. Chillálo, 9000 ft., 12–17. xi. 1926, 2 ♀ (*Scott*); Maraquo, v. & xi. 1914, 15 ♀ and 1 ♂

(*Kovacs*); Alaba, 15. xi. 1911, 1 ♀ (*Stordy*); Harar, 3 ♀ (*Kristensen*). This form of *B. griseus* is distributed over Eastern Africa from Abyssinia to Natal, and occurs also in South Arabia.

I have followed du Buysson in regarding *B. menelikii* as a colour-phase of the common *B. griseus* (Fabr.). The terminal segments of the antennæ of the single male available for study show some slight differences from those of typical *B. griseus*, the expansions at the underside of the ninth, tenth, and eleventh segments being much less pronounced, while the twelfth segment appears to be rather wider. If a large series of males from Abyssinia were found to agree in these characters I should be inclined to regard *menelikii* as entitled to specific rank.

There is no reliable record of typical *B. griseus* from Abyssinia, where it seems to be entirely replaced by the var. *menelikii*. Records of this form from Eritrea, Somaliland, and South-Western Arabia appear to be correct. I am very sceptical, however, as to the correctness of the identification of the supposed *menelikii* listed by du Buysson from Kenya Colony (Nairobi), Tanganyika Territory, Portuguese East Africa, Transvaal, Natal, and the Gaboon (Ogowe), as well as those recorded from the Belgian Congo (mostly from the Katanga) by Schouteden (Rev. Zool. Afric. vi. p. 186, 1919) and Schulthess ('Senckenbergiana,' x. pts. 3–4, p. 96, 1928). All the many examples of *B. griseus* from the Katanga that I have seen belong to a quite different colour-form, for which the name *erythrospilus* Cameron might perhaps be retained.

Polistes marginalis Fabr.

Loc. Abyssinia: Mt. Zukwala, ca. 9000 ft., 24–25. x. 1926, 11 ♂, 4 ♀ (*Omer-Cooper*); Doukam, 18–19. x. 1926, 1 ♀ (*Scott*); plains north of Lake Zwai, 5500–6000 ft., 3–4. xi. 1926, 9 ♀ (*Scott*); Maraquo, xi. 1914, 3 ♂, 20 ♀ (*Kovacs*); Alaba, 15. xi. 1911, 1 ♀ (*Stordy*); Addis Ababa, 3 ♀ (*Stordy*); Harar, 2 ♀ (*Kristensen*).

This species is distributed throughout all that part of Africa within the Ethiopian Region, and in Southern Arabia.

One male and one female in the series collected by Kovacs have each a pair of pollinia of an Asclepiad stuck to the empodium of one of the middle pair of tarsi. It is, perhaps, worth recalling the large, partly coloured, figure of a pair of pollinia of *Asclepias* attached to the pulvillus of the tarsus of a fly (see T. H. Corry on *Asclepias cornuti*, Trans. Linn. Soc. London, ser. 2 (Bot.), ii. pl. xxvi. fig. 19, 1883).

Supplementary List of Vespidæ. By HUGH SCOTT.

The following is a list of species no examples of which were obtained by the Expedition of 1926–7, but of which the British Museum has Abyssinian specimens. Many of the records are published for the first time *. The general distribution of the species is mainly taken from Bequaert's "Catalogue of the Ethiopian Vespidæ" (cited above, in the opening remarks on this family).

A much longer list of Abyssinian species could be compiled. Many are included in Bequaert's "Catalogue," but in some of the earlier-described species the only locality given is "Abyssinia," and in other cases the localities cannot easily be traced, so that it is difficult to know which species form part of the fauna of the highlands. Other species can be found in more recent papers, e. g., *Eumenes gribodi*, sp. n., from Let-Marefià, Shoa, described by Dr. D. Guiglia (Ann. Mus. Civ. Genova, liii. p. 423, 1929), and records of various species not new to science in the same writer's "Contributo alla conoscenza della fauna imenotterologica dell' Africa orientale" (Mem. Soc. ent. Ital. x. pp. 118–136, 1931).

The specimens recorded in the subjoined list were determined by G. Meade-Waldo unless it is otherwise stated :—

Paramischocyttarus subtilis Magr. Harar, 1 ♀ (*Kristensen*). Abyssinia, East Africa (the British Museum also has an example, determined by Meade-Waldo, from Southern Nigeria).

Labus annulipes Cam. Higo Samula, 30. x. 1911, 1 ♂ (*Stordy*). East Africa, Nyasaland, Northern Rhodesia.

Eumenes maxillosus de Geer, var. *fenestralis* Sauss.

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* Some appeared in Meade-Waldo's "Revision of Species of the Genus *Odynerus* occurring in the Ethiopian Region," Trans. Ent. Soc. 1914, pp. 485–520, pl. xci. (1915); others may have been included in scattered papers.

Das, 21. x. 1911, 1 ♀ (*Stordy*); Alaba, 15. xi. 1911, 1 ♀ (*Stordy*). The var. *fenestralis* is widely distributed in Tropical Africa.

E. lepeletieri Sauss. Higo Samula, 30. x. 1911, 1 ♂ (*Stordy*). Widely distributed in the part of Africa within the Ethiopian Region.

E. xanthaspis Cam. (=*E. melanosomus* Sauss., var. *affinis* Schulth., in Bequaert's Catalogue). Higo Samula, 30. x. 1911, 2 ♀ (*Stordy*). East Africa; the specimens in the British Museum are nearly all from rather high altitudes, between 3000 and 5000 ft.

Nortonia rufolineata Cam. (described as *Eumenes rufolineatus*, and so catalogued by Bequaert; transferred to *Nortonia* by Meade-Waldo in Brit. Mus. Coll.). Harar, 1 ♂ (*Kristensen*); Gatelo Amaiyu, 4. xi. 1911, 1 ♀ (*Stordy*). Nyasaland, Uganda; described from South Africa.

Odynerus (*Rygchium*)* *forticulus* Kohl. Harar, 1 ♂, 1 ♀ (*Kristensen*), J. Bequaert det. Southern Arabia Egypt.

O. (*R.*) *ventralis* Sauss. (*O. synagroides* Sauss. 1852). Maraquo, 7. v. 1914, 1 ♂ (*Kovacs*), J. Bequaert det. Widely distributed in Tropical Africa, and recorded from Madagascar.

O. (*R.*) *synagroides* (Sauss.) (*Rygchium synagroides* Sauss. 1852). Higo Samula, 30. x. 1911, 1 ♂, of the typical colour-phase (*Stordy*), and another ♂, belonging to var. *beta*, labelled only "Abyssinia" (*Stordy*), both determined by Bequaert. Widely distributed in Tropical and South Africa, and occurs in Southern Arabia.

O. (*R.*) *harrarensis* Meade-Waldo. Harar, 2 ♂, 5 ♀ (*Kristensen*), including the type (♀). The distribution is Abyssinia and East Africa.

O. (*R.*) *mutabilis* Sauss. Harar, 1 ♀ (*Kristensen*). Previously recorded only from Abyssinia, but the British Museum has 1 ♂ from Kenya; Simba, 3350 ft., iv. 1911 (*Neave*).

O. (*R.*) *simplidentatus* Meade-Waldo. Harar, 2 ♂ (*Kristensen*). Type and other specimens from Rhodesia.

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* All the species of *Odynerus* listed here are referred, in accordance with Dr. Bequaert's Catalogue, to the subgenus *Rygchium*, though some of them, when originally described, were placed in other subgenera.

O. (*R.*) *armatiscutis* Cam. Higo Samula, 30. x. 1911, 3 ♀ (*Kristensen*). Described from East Africa (Kilimanjaro), and the British Museum also has a specimen from Mt. Kenya, between 6500 and 8000 ft., and one from Mt. Elgon, 3700–3900 ft.

O. (*R.*) *defractus* du Buyss. Harar, 2 ♂ (*Kristensen*). East Africa, Abyssinia, Eastern Sudan.

O. (*R.*) *metemmensis* Magr. Harar, 7 ♂ (*Kristensen*). Nubia, Somaliland, Abyssinia *.

O. (*R.*) *kristenseni* Meade-Waldo. Harar, 1 ♀, the type (*Kristensen*). Recorded only from Abyssinia.

Synagris abyssinica Guér. Maraquo, xi. 1914, 1 ♂, of the typical form (*Kovacs*), J. Bequaert det.; and 1 ♂ of var. *emarginata* Sauss., labelled only "Abyssinia" (*Stordy*), F. Maidl det. Widely distributed in Tropical Africa, from Abyssinia southwards throughout the eastern part of the continent, and in South and South-west Africa.

S. æstuans F. Maraquo, xi. 1914, 1 ♀, of the typical form (*Kovacs*), J. Bequaert det. Widely distributed in Equatorial Africa, both west and east.

S. analis Sauss. 1 ♂, labelled only "Abyssinia" (*Stordy*), F. Maidl det. First described from Abyssinia, widely distributed in the eastern part of Tropical Africa and in South Africa.

S. calida (L.). Maraquo, xi. 1914, 2 ♀ (*Kovacs*), J. Bequaert det. Widely distributed in that part of the African continent within the Ethiopian Region, apparently not, however, previously recorded from Abyssinia.

S. spinosuscula Sauss. Harar, 1 ♀ (*Kristensen*); Hawash, 1 ♀ (*Stordy*), both determined by J. Bequaert. Abyssinia, Eritrea, Kenya.

Belonogaster abyssinicus du Buyss. Higo Samula, 30. x. 1911, 1 ♀ (*Stordy*). Abyssinia, Eritrea.

Ropalidia [*Icaria*] *cincta* (Lep.). Higo Samula, 30. x. 1911, 1 ♀ (*Stordy*). Widely distributed in Tropical Africa, also occurs in the Transvaal and Southern Arabia (recorded from as high as ca. 6500 ft. (2000 m.) in Ruwenzori).

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* The British Museum has 2 ♀ from Tanganyika Territory (Noisinak Bridge, 6500 ft., 1916, *Lamborn*) placed under this species, but I am not sure if the identification is right.

X.—*On a new Triassic Catopterid Fish from New South Wales.* By the Rev. R. T. WADE, M.A., Ph.D.

IN a large collection of fishes from Brookvale, near Sydney, New South Wales, there are many specimens of a new Catopterid genus. Since closely allied fishes from the Lower Triassic beds of South Africa are under examination, and the publication of a monograph on the complete Brookvale fish fauna has been delayed, this short preliminary account is published for comparison.

Genus BROOKVALIA, nov.

Diagnosis.—Catopteridæ with trunk elegantly fusiform. Head longer than deep. Tabulars large, quadrangular; post-parietals triangular; parietals small; frontals large; supra-temporals extensive. Nasals small; post-rostral large, triangular. Operculum quadrangular; suboperculum much deeper than operculum; infra-operculum quadrangular, smaller than operculum. Pair of X-plates anterior to operculum; preoperculum extends far over maxilla. Mandible tapers anteriorly. Sharp teeth on jaws and within mouth. Post-temporals large; supra-cleithrum long, narrow; cleithrum massive; post-cleithral scales present. Supra-orbital sensory canal joins infra-orbital canal. Skull-bones with granular ornament. Jaws and pectoral arch ornamented with long irregular rugæ. Dorsal and anal fins high, triangular; anal fin the more remote; caudal fin equilobate. Scales small, bearing prominent obliquely placed rugæ. Fulcral scales at base of anal and dorsal fins. Fulcra on fins of mature fishes.

1. *Brookvalia gracilis*, sp. n.

Diagnosis.—A *Brookvalia* with post-parietals relatively large; parietals small, subrectangular, placed with longer axis at high angle to mid-line of head. Two small bones between preoperculum and orbital series. Faint sparse granular ornament on upper head-bones. Origin of dorsal fin close to mid-point of back of fish; anal fin larger than dorsal, slightly more remote. Pectoral fins with few long stout rays; pelvic pair shorter. Scales ornamented with single ruga diagonally placed.

Material.—The holotype, the external impression of an imperfect fish, in counterpart (Brit. Mus., nos. P. 15799, P. 15800), and at least one hundred similar specimens.

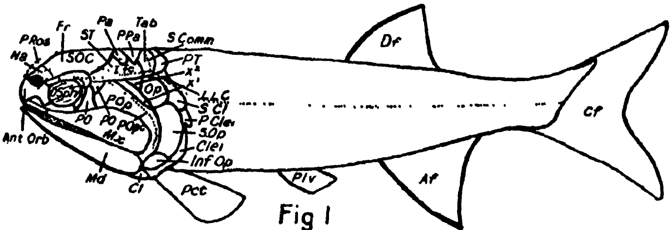

Fig I

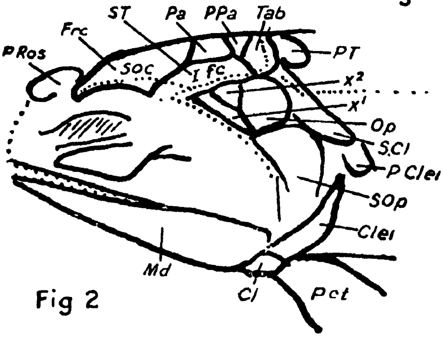

Fig 2

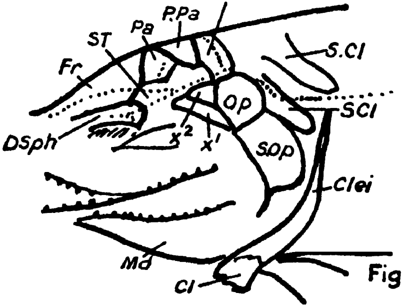

Fig.

Fig. 1.—*Brookvalia gracilis*, gen. et sp. n. Reconstruction based largely on the holotype and counterpart (Brit. Mus. nos. P. 15799, P. 15800). × 1 nat. size. Scales, fin-rays, and ornament omitted.

Fig. 2.—*Brookvalia propennis*, gen. et sp. n. Sketch of head of no. U.S.G.D. 203, Geol. Mus. Sydney Univ. (slightly restored). × 2 nat. size.

Fig. 3.—*Brookvalia parvisquamata*, gen. et sp. n. Sketch of head of no. U.S.G.D. 191, Geol. Mus. Sydney Univ. (slightly restored). × 2 nat. size.

Lettering.

Af, anal fin; *Ant.Orb*, antorbital; *Cf*, caudal fin; *Cl*, clavicle; *Clei*, cleithrum; *Df*, dorsal fin; *DSph*, dermo-sphenotic; *Fr*, frontal; *Inf.Op*, Infraoperculum; *Ifc*, infraorbital canal; *Md*, mandible; *Mx*, maxilla; *Na*, nasal; *Op*, operculum; *Pa*, parietal; *P.Clei*, post-cleithral; *Pct*, Pectoral fin; *Plv*, pelvic fin; *PO*, post-orbital; *P.Op*, preoperculum; *POpc*, preopercular canal; *P.Pa*, post-parietal; *P.Ros*, post-rostral; *PT*, post-temporal; *S.Cl*, supra-cleithrum; *S.Comm*, supra-temporal commissure; *SOC*, supra-orbital canal; *S.Op*, sub-operculum; *ST*, supra-temporal; *Tab*, tabular; X^1, X^2, supplementary opercular plates.

Formation and Locality.—The Hawkesbury Sandstone Formation, Brookvale, about 10 miles E. by N. from Sydney, N.S.W.

Description.—Specimens vary in length from 3 cm. to 12 cm. The depth of the trunk at the origin of the dorsal fin is about one-fifth of the total length of the fish.

The text-figure exhibits in almost their proper shapes and relationships the known bones of the left side of the head. The tabulars (*Tab*) are quadrangular; their supero-posterior angles are produced and meet on the mid-line. The post-parietals (*P.Pa*) are large triangular plates which have their shortest sides in contact at the mid-line and their vertices directed outwardly from it. The parietals (*Pa*) are much smaller than the post-parietals. They are subrectangular and are placed with their longer axis at a high angle to the mid-line of the head, which truncates a corner of each, and so forms a very short line of contact for the pair. Anteriorly the frontals (*Fr*) become narrower. Bounded by the small nasals (*Na*) and the anterior sections of the frontals there is a large post-rostral (*P.Ros.*) covering most of the snout. Of the circumorbital series the large bone (*D.Sph*) is well preserved in many specimens; the antorbital (*Ant.Orb*), too, is well preserved, and only its anterior extension is doubtful; the exact limits of the remaining circumorbitals are not known. The post-temporals (*PT*) are large and triangular and their acute angles meet at the mid-line of the head. The clavicle (*Cl*) is massive. The outer walls of the sensory canals of the head are broken away, and the canals are represented by deep narrow channels. The supra-orbital canals (*SOC*) join the infra-orbitals (*Ifc*) in the supra-temporals. A head-line of "pit-organs" is preserved in the parietals. In the type-specimen the dorsal fin (*Df*) is 1 cm. long, ·75 cm. high, and has 32 rays; the anal fin (*Af*) is 1·4 cm. long, 1·1 cm. high, and has 42 rays. There are fulcral scales at the origin of each fin. Caudal fin (*Cf*) has about 60 rays. A pectoral fin (*Pct*) has 16 rays. A pelvic fin (*Plv*) has about 20 rays which are much shorter than those of the pectoral pair. There are not less than 55 transverse rows of scales; the seventh transverse row from the head has at least 28 scales. The scale-ornament is a single, slightly curved or straight ruga lying nearly along the diagonal of the scale.

2. *Brookvalia propennis*, sp. n.

Diagnosis.—A *Brookvalia* differing from *B. gracilis* in the following important respects :—Parietals thickly quadrangular, larger than post-parietals. Conspicuous ornament of frequent coarse granules on bones of cranial roof, of less frequent granules on opercular apparatus, and of prominent rugæ on cleithrum and supracleithrum. Teeth smaller than in *B. gracilis*. Dorsal fin completely in advance of anal ; anal fin is smaller than dorsal or than a pectoral fin, and only slightly larger than a pelvic fin. Fins are shorter based relative to their depth than those of *B. gracilis*. The principal anterior flank-scales bear three ornamenting rugæ.

Material.—The holotype, the external impression of an imperfect fish(no. U.S.G.D. 203, Geol. Mus. Sydney Univ.), and two similar specimens (Brit. Mus. nos. P. 15825, with counterpart P. 15868, and P. 15850).

Description.—The fish has approximately the size and proportions of *B. gracilis*.

The known bones of the head are shown in fig. 2. A pectoral fin has about 12 strong, and a few much smaller rays ; its rays are longer than those of the anal. The pelvic pair have 18 or 20 rays each. The dorsal fin of 29 rays is entirely in advance of the anal fin, which has 20 rays. Caudal fin has about 40 rays. There are about 48 transverse rows of scales, whereas *B. gracilis* has 58 such rows.

3. *Brookvalia parvisquamata*, sp. n.

Diagnosis.—A *Brookvalia* with shorter and stouter head than *B. gracilis*. Parietals small and nearly rhombic. Small triangular post-parietals. Ratio of length of suboperculum to its depth less than in *B. gracilis*. Median fin with fewer rays than those of type-species ; dorsal fin before anal for about half its length. Principal flank-scales only a little deeper than long. Ornament usually a single diagonal ridge ; many anterior scales have two ridges.

Material.—The holotype, the impression of an imperfect fish (Brit. Mus., no. P. 15798) and two similar specimens (Brit. Mus. no. P. 15843 ; Geol. Mus. Sydney Univ., no. U.S.G.D. 191).

Description.—Measurements of the holotype are :— Total length 11·8 cm. (?), maximum depth of body 2·4 cm. ; length of head 2·5 cm.

Known bones of head as shown in fig. 3.

The dorsal fin has 26 rays ; the anal fin 36 rays. Principal flank-scales are ·133 cm. deep and ·1 cm. long, whereas similar scales of *B. gracilis* are ·2 cm. deep and ·1 cm. long.

XI.—*On the Biology of the Theromorphous Reptile* Euchambersia. By Dr. Francis, Baron Nopcsa.

The most interesting reptile lately discovered in the Karroo Formation of South Africa is *Euchambersia*, which was described by R. Broom in 1930. It differs from all Theromorpha and *from all fossil reptiles hitherto known* by two characters :—

(1) By having one strong keel on the outer (labial) side of each canine tooth.

(2) By having a huge deep hollow on the outer side of the maxillary and lacrymal bone. This hollow opens as a broad furrow on the palatal side of the skull behind the canine.

The lack of molars, which is likewise a curious feature of *Euchambersia*, occurs also in some allied types such as *Whaitsia* and *Notosollasia*.

Although Broom recognized that the cavity on the maxilla of *Euchambersia* probably accommodated a huge gland, he failed to recognize that this structure was evidently in correlation with the unique structure of the canine. As soon as one accepts the hypothesis that these two unique features are in correlation their functions become clear. The excavation evidently lodged a huge poison-gland, while the two furrows on both sides of the ridge of the canine served to lead the poison into the tissue of the prey when bitten.

The possibility of Theromorpha having developed a poison organ may be deduced from the fact that a temporary poison-gland is also present in the male *Ornithorhynchus*, where it is in connection with the spur. As for the possibility of transmitting poison by means of a furrow, *Heloderma* may be mentioned. This lizard does not inject the poison in the manner of snakes, but by holding on to its prey until the poison is conveyed by capillarity along the tooth.

The poison-glands of reptiles have a varied origin. In the primitive Ilysiidæ two poison-glands are present—the parotic gland and the anterior temporal gland; in other snakes only one of these glands is present; finally, in *Heloderma* the poison is secreted by a mandibular gland. All this shows that different salivary or mucous glands can be converted into poison-organs, and thus there is nothing to prevent one from explaining both aberrant characters of *Euchambersia* as traces of a venomous organ. This is also the reason why all the molars behind the poison-fang are wanting.

The heavy limb-bones of the related *Whaitsia* seem to indicate that *Euchambersia* was also a sluggish creature, and if it was poisonous there can be no doubt that it was not a carrion eater but fed on living prey.

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XII.—*Descriptions and Records of Bees.*—CXLV.

By T. D. A. COCKERELL, University of Colorado.

Andrena boswendica Viereck.

British E. Africa: Kabete, 6000 ft., Dec. 18–20, 1918, 2 ♀ (*T. J. Anderson*).

Compared with a co-type of *A. boswendica* from Boswenda, Belgian Congo, and undoubtedly the same.

Andrena notophila, sp. n.

♀.—Length about 12·6 mm.

Black, including mandibles, antennæ, and legs, but spurs pale reddish; head ordinary, facial quadrangle broader than long; malar space practically obsolete;

process of labrum large, broadly rounded; facial foveæ broad, going a little above top of eye, little separated from orbits, ending below level of antennæ, and almost without pubescence; clypeus rugoso-punctate, not keeled; front dull, with a minutely granular appearance, but the microscope shows fine striæ below the ocelli; third antennal joint finely hairy, longer than next two together, but hardly as long as next three; hair of face, cheeks, and occiput pale dull fulvous, of front largely black, of vertex copious and black, the hairs directed forward; mesothorax finely and densely punctured, moderately shining on disc; disc of scutellum shining and feebly punctured; area of metathorax triangular, rugulose, hardly defined; hair of thorax above mainly fox-red, but a large patch of short black hair on disc; on sides of thorax and beneath the hair is pale greyish, slightly fulvous. Legs with mainly pale hair; hind tibial scopa light red, not plumose (in the type loaded with orange pollen, evidently from a species of Compositæ); hind basitarsi rather broad, but not as broad as tibiæ. Abdomen dullish, finely punctured, the punctures dense on first two tergites; second tergite depressed less than half; tergites 1 to 3 with broad continuous bands of rather long dull pale fulvous hair, fourth with a pallid margin and very thin band; first three tergites with pale hair before the band, but fourth with black; apical tuft black; venter with pale reddish hair, black at apex; tegulæ very dark brown. Wings dusky hyaline, darkened at apex.

Orange Free State: Ficksburg, Feb. 26 to March 1, 1931 (*J. Ogilvie*).

This is a perfectly typical *Andrena*, distinguished from *A. peringueyi* Friese (Cape Province) by the dark hind tibiæ and tarsi and the black apical tuft of abdomen. In various tables of European species it seems to fall near *A. listerella* Kirby (by the black hair on disc of thorax, but the abdomen is quite different), and more especially *A. flavipes* Pz. (*fulvicrus* Kirby). It does indeed look very much like *A. flavipes*, but it is larger, and the abdominal bands are broader, with longer hair. In the wings the stigma is very dark, obscurely reddish, and the second cubital cell receives the recurrent nervure before the middle; in *A. flavipes* the stigma is clear red and the recurrent nervure is received by the second cubital cell at or beyond the middle. In both the basal nervure falls just short of the nervulus. It is surprising to find genuine *Andrena* in South Africa *, but it is an ancient genus, there being a species (*A. wrisleyi* Salt) in Baltic amber of Oligocene age.

NOTOMELITTA, gen. nov.

Type : *Notomelitta neliana* (*Rediviva neliana* Cockerell, Ann. & Mag. Nat. Hist., Oct. 1931).

Since describing this species I have seen *Andrena peringueyi*, the type-species of *Rediviva*, and it is a genuine *Andrena*. A new generic name is therefore required, with the characters already published.

Anthidium capense Cameron.

Both sexes were collected by Nel at Lady Grey, C.P.

Epeolus glyptochilus Bischoff.

S. Rhodesia : Vumba, Umtali, May 23–26 (*A. M.*).

Serapista intermedia, sp. n.

♀ (type).—Length about 10 mm., anterior wing 7·7.

Similar to *S. rufipes* Friese, and formerly referred by me to that species, but differing by the five-tuberculate margin of clypeus and shining mesothorax, characters of the larger *S. friesei* Brauns. The mandibles, labrum, and malar space are dark red; extreme base of scape bright ferruginous ; third and fourth antennal joints red beneath ; femora blackish, but tibiæ and tarsi bright ferruginous, varying to femora black and tibiæ and tarsi dusky red ; upper border of prothorax with reddish hair ; margins of scutellum and axillæ fulvous ; tegulæ black, with very narrow fulvous margins and large patches of dull white tomentum anteriorly and posteriorly. Wings hyaline, with a dark streak in marginal cell, and region beyond the cells a little dusky, violaceous ; reddened dentiform processes at sides of tergites 2 to 6, the first appressed to the side and difficult to see ; ventral scopa ferruginous, blackened apically, and with white hair at sides. Smaller than *S. denticulata* Sm. or *S. friesei* Brauns, and distinguished by the red tibiæ and tarsi. The lateral white spots before the bands on abdomen are much smaller than in *S. denticulata.*

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* No less than six species from South Africa, described by authors as *Andrena*, have proved to belong to quite other genera.

♂.—Very similar to *S. denticulata* but smaller, the scape and base of flagellum clear red; terminal segment of abdomen wider, so that the long lateral spines are further apart, while the middle spine and middle part of the tergite generally are red. In both the tegulæ have a large transverse light yellow spot anteriorly. The clypeus is shining yellow.

Cape Province: Huguenot, Feb. 5–10 (*J. O.*, *A. M.*).

When working at the British Museum I too hastily referred this to *S. rufipes* Friese, to which it exactly runs in my key to *Serapista* (1930). *S. rufipes* comes from Cradock, about 400 miles east of Huguenot. The present species is intermediate between *S. rufipes* and *S. friesei*, but surely distinct from both.

Morgania natalensis, sp. n.

♂.—Length about 11 mm., anterior wing 9.

Entirely black, except that the inner edge of the mandibles is bright ferruginous; labrum large, dull, densely and minutely punctured, but with a shining median depression, from which a rapidly widening shining but punctured band descends to the lower margin; clypeus short, almost semicircular, densely rugoso-punctate, but with a broad straight shining margin; face not exceptionally broad, but orbits nearly parallel; antennæ 12-jointed, the flagellum thick; cheeks, upper parts of sides of face, and sides of front more or less, with silvery-white hair, but face otherwise bare and black; upper border of prothorax, margin of tubercles, hind borders of scutellum at sides, and very broad band across mesopleura with pure white hair; mesothorax closely and very coarsely punctured, anteriorly at sides the punctures run in rows; middle of mesothorax with a very broad sulcus or concavity between two obtuse ridges; scutellum very strongly bigibbous; area of metathorax very densely and minutely punctured and dull, but contiguous part of metathorax shining; tegulæ black. Wings dilute fuliginous, stigma narrow-lanceolate, black; basal nervure going a short distance basad of nervulus; second cubital cell receiving first recurrent nervure about the middle and second almost at the end.

Tibiæ and tarsi with silvery-white hair on outer side, the basitarsi with pale red hair on inner side. Abdomen broad, shining, but tergites with very broad minutely punctured margins; first tergite with white hair at base and a large subquadrate silvery-white spot at each side; tergites 2 to 4 with very broad white bands at sides only, but on fourth only rather briefly interrupted; tergites 5 and 6 with entire bands; venter with much white hair beyond the second tergite.

Natal: National Park, March 3–15 (*A. M.*).

This is extremely similar in appearance to *Ammobates oraniensis* Lep., but differs by the much longer marginal cell etc. It belongs to the group of *M. graenicheri* Brauns, *M. jenseni* Friese, *M. jonesi* Ckll., and *M. alboguttata* Friese. It will be known by the bare face (not covered with white hair, the broadly sulcate mesothorax, and the venation. I thought at first that it might be the male of *M. jonesi*, but there are too many differences. *M. alboguttata* is more likely to be the male of *M. jonesi*, the latter having a year priority.

Bischoff (1923) suggests that *M. jenseni* may be a race of *M. graenicheri*. I studied both in the Transvaal Museum, and considered them distinct, on the following characters:—

Very large; larger and more robust than *M. fortis* Ckll. (*magnificus* Br.); abdomen with lateral marks of dense white tomentum; sides of face broadly covered with dense white hair; wings darkened, nervures very dark; marginal cell slender, elongated, but truncate; second cubital cell receiving first recurrent nervure beyond middle, second practically at apex; prothorax above with dense white hair; mesothorax very coarsely punctured, not sulcate in middle; scutellum strongly bigibbous; pygidial plate large; tibiæ densely covered with pure white tomentum on outer side. (Johannesburg.)	*graenicheri* Brauns, ♀.
Similar in aspect but considerably smaller; white marks on abdomen very distinct; mesothorax sulcate in middle; scutellum very strongly bigibbous; basal nervure goes a little basad of nervulus; second cubital cell receiving first recurrent nervure far from base, but much before middle, second not far from apex; tibiæ densely covered with white hair on outer side	*jenseni* Friese, ♀.

Crocisaspidia fasciata (Friese) race *mackieæ*, nov.

♂.—Agrees in general with *C. fasciata*, but third and fourth antennal joints entirely bright red beneath; abdominal bands pure white at sides, pellucid greyish in middle, the fifth white right across; hind tibiæ broadly red at end and the lobe light ferruginous to base; hind tarsi red. Wings yellowish hyaline, more or less suffused with fulvous along the veins, apical margin and apex of marginal cell faintly dusky. The stigma is ferruginous.

Cape Province: Huguenot, Feb. 5–10 (*A. M.*).

From Friese's brief account I could not well differentiate this except by the greater amount of red on hind legs; but I borrowed from the American Museum one of Friese's original specimens, from Shilouvane, Transvaal, and observed that the wings were fuliginous, the abdominal bands with faint bluish-green tints, and the fourth antennal joint and part of fifth bright red beneath.

Thrinchostoma nomiæformis Cockerell.

♀.—S. Rhodesia: Matopo Hills, April 17–30 (*A. M.*).

Blüthgen considers this identical with *T. torridum* (Smith), but, although the differences are slight, they can be distinguished.

Cœlioxys percarinata Cockerell.

♀.—Cape Province: Huguenot, Feb. 5–10 (*J. O.*).

Described from the highlands near Lake Kivu.

This adds one more to the list of species found in the mountains near the Equator and near sea-level in South Africa.

Megachile (*Creightonella*) *madiensis*, sp. n.

♂.—Length 15 mm.

Black, including mandibles and antennæ, but legs dark rufous and the irregular teeth at the end of the abdomen red; hair of head and thorax pale dull fulvous, of cheeks and under parts of thorax dull white; first three tergites with dense bright ferruginous hair, but yellowish white at sides of second and more broadly on third; fourth with very thin short pale hair, not hiding the surface; fifth and sixth with black hair; hind margins of tergites black; tegulæ pale testaceous. Wings hyaline, very slightly yellowish, apex dusky, especially just beyond the marginal cell; stigma rudimentary, light ferruginous; basal nervure meeting nervulus; second cubital cell receiving first recurrent nervure a considerable distance from base. Legs with mainly pale hair, but black on outer side of middle tarsi, long black hair on inner side of hind tibiæ, and hair on hind tarsi all black, except a little pale at extreme base; spurs red. Apex of abdomen (keel of sixth tergite) large and quadrate, sharply keeled in middle, the apex with a semicircular emargination, and irregular red teeth on each side of it; fourth sternite with a broad semicircular incision, bounded by a reddish spine on each side; from beneath it is a long tongue-like structure, broad at base and narrow at apex, having on each side a process, the transverse end of which is whitish as seen under microscope, while with a lens it has the appearance of two transverse shining lobes. The clypeus has a long beard of brown hair, but there is a patch of black hair at each side of face and the hair between antennæ and on front and vertex is light brownish; the anterior tarsi are stout, but not otherwise modified; mesothorax entirely dull, excessively densely and minutely punctured.

Uganda: Madi, May 1927 (*G. D. H. Carpenter*).

In my table of male *Creightonella* (1931) this runs near *M. mitimia* Ckll., which differs by the much darker tegulæ, red margins of tergites, and black legs, with bright red hair on inner side of hind tarsi. In both the mandibles have large lobes beneath, more or less reddened at end, but especially so in *M. madiensis*.

Tetralonia nostra, sp. n.

♂.—Length about 9·5 mm., anterior wing 7·7.

Black, with the long flagellum (reaching beyond middle of second tergite) wholly black; facial quadrangle longer than broad, the orbits parallel; clypeus yellowish white, with a broad black band along each side above, so that the outline of the light colour is broadly pyramidal; mandibles reddish in middle, but no light spot at base; labrum yellowish white; scape swollen; eyes pale brownish; hair of head rather dull white; hair of thorax long and dull white, but very dark brown on posterior disc of mesothorax and on scutellum; mesothorax shining between the dense large punctures; scutellum densely punctured, with a little shining median ridge anteriorly; tegulæ dull wood-brown, the margin paler. Wings hyaline, very faintly dusky, stigma dark red, nervures dark brown; basal nervure falling far short of nervulus; second cubital cell square. Legs with dull white hair, chocolate-brown on inner side of tarsi; spurs whitish. Abdomen finely and closely punctured, with bands of dense greyish-white tomentum, narrow at base of second tergite (broadening at sides), broad at base of third, and covering fourth and fifth except the apex narrowly; sixth with dense white hair, stained with red in middle; apical plate dark reddish, with red hair on each side of it. The hind femora have a low dentiform angle about middle of lower margin.

S. Rhodesia: Jesse, April 13 (*L. O.*).

Allied to *T. nubilis* Ckll., but that is much larger and has long hair on second tergite. There is much resemblance to *T. nigricans* Ckll., but in that species the light area on clypeus is much smaller, the apical plate is narrower, and the hair on inner side of hind basitarsi is light orange-fulvous. The wings are more dusky in *T. nigricans*.

Tetralonia fulvomarginata Cockerell.

Orange Free State: Ficksburg, Feb. 26 to March 1 (*A. M.*); 1 ♀.

Described from Natal.

Tetralonia natalica, sp. n.

♀.—Length about 12 mm.

Black, robust, the tarsi rufescent apically; clypeus and antennæ black; eyes greyish brown; face broad; hair of head dull white, fuscous on vertex; mandibles typically without, but sometimes with, a conspicuous red subapical spot; mesothorax closely and finely punctured, somewhat shining; hair of thorax dull white, with a strong brown suffusion dorsally; base of metathorax rugulose; tegulæ pale testaceous. Wings greyish hyaline; basal nervure meeting nervulus, or falling a trifle short of it; second cubital cell broad. Legs with reddish hair, the copious scopa of hind tibiæ and basitarsi light red. Abdomen broad, very finely punctured, hind margins of tergites very narrowly brown; base of first tergite with long white hair; tergites 2 to 4 with white hair-bands at base, narrow in middle, broadening at sides, in all cases leaving the very broad hind margin bare; fifth and sixth tergites with brownish-black hair, the fifth with long pale fulvous hair at extreme sides; venter with reddish hair.

Natal: National Park, March 3–15 (*A. M.*, *J. O.*, *L. O.*); 3 ♀.

Resembles *T. braunsiana* Fr., but that differs by the light hair covering margin of fourth tergite and the pure white hair at sides of fifth.

Tetralonia nyassana Strand.

Belgian Congo: south of Bukavu, Aug. 28 (*Ckll.*); ♂. Flagellum black, hair of thorax above creamy white.

Uganda: Kampala, July 27 and Nov. 17 (*C. C. Gowdey*); ♂. Flagellum black, hair of thorax above redder, in one bright fox-red.

Uganda: Bwamba Pass, 6000 ft., Jan. (*G. D. H. Carpenter*); ♂. Flagellum variably dark reddish beneath, hair of thorax above strongly reddened.

This runs to *T. nyassana* in Meade-Waldo's table (1914), and agrees in the toothed hind femora and clypeal mark with an upper triangular extension. Strand's description applies quite well, but the species is variable.

Tetralonia trichardti, sp. n.

♀.—Length about 10 mm.

Black, the tegument of clypeus black, except a very narrow red margin; labrum black, the lower middle with conspicuously reddened hair; base of mandibles entirely black, outer side of apical part variably orange; facial quadrangle square; eyes dark reddish brown; flagellum, except basally, red beneath; hair of head and underside of thorax pale, tinted with fulvous, whiter on lower part of cheeks; hair of thorax above orange-fulvous, dense and very bright on scutellum and above tubercles; mesothorax dull; tegulæ light rufotestaceous. Wings dusky hyaline, stigma and nervures dark brown; basal nervure falling short of nervulus; second cubital cell very broad. Anterior femora and tibiæ with pale hair, the latter with a red tuft at end; tarsi red apically; anterior basitarsi with greyish-brown hair on outer side and copper-red on inner; spurs red; middle tibiæ with dense pale red hair externally near apex, hind tibiæ with a band of the same hair extending halfway down outer side from knee-plate; middle basitarsi with brownish-grey hair; scopa of hind tibiæ and basitarsi of long dark (grey to black) hairs, not dense, on outer side beautifully but briefly plumose; apical brush of basitarsi shining copper-red. Abdomen broad, the hind margins of tergites broadly and suffusedly rufescent; base of first tergite with erect dull white hair; tergites 2 to 5 with broad basal bands of greyish-white tomentum; apical margin of fifth tergite with dark brown hair, creamy white at sides; venter with reddish hair.

Transvaal: Louis Trichardt, April 4–10, 9 ♀ (*J. O.*, *A. M.*).

Near to *T. brunnescens* Ckll. from Natal, the abdomen having quite the same appearance, but the tibial scopa will at once distinguish it.

Tetraloniella mimetes, sp. n.

♀.—Length about 6·5 mm., anterior wing 4·2.

Robust, with dull white pubescence. Head and thorax shining black; the convex polished clypeus, the labrum, and large triangular supraclypeal mark yellow (reddened by cyanide in type); clypeus very short, transverse; labrum with large irregular punctures; mandibles pale rufous basally, on underside bearing a small number of very long outstanding hairs; facial quadrangle about square; eyes purplish grey; antennæ entirely ferruginous; scopa rather short, curved, its hair very short and sparse; second joint longer than broad; third slender, longer than next two together, but not as long as next three; mesothorax shining, not densely hairy; middle of metathorax rufous, with a large pit; tubercles bright ferruginous; tegulæ large, testaceous. Wings hyaline, stigma and nervures red; basal nervure falling a little short of nervulus; recurrent nervures received at equal distances from ends of second and third cubital cells; second cubital much contracted above, third very long, more than twice as broad on marginal as second. Legs light red, scopa of hind tibiæ and basitarsi very large, white. Abdomen broad, shining, light red, with dull white hair as follows: a little on shoulders of first tergite, interrupted band on second, very broad complete bands on third and fourth, and all of fifth and apex, except that the apex is reddened on each side of the small dark apical plate.

Sudan: Nuri, May 25, 1910 (*H. H. King*). Imperial Institute of Entomology.

Related to *T. graja* Ev., but very much smaller, with clear red legs and abdomen. Superficially, it looks exactly like a species of the Neotropical genus *Exomalopsis*. It has, however, quite different wings and antennæ, and I notice that the outer margin of the maxillary blade is closely cross-striate, which is not the case in *Exomalopsis*.

Eucara straminea, sp. n.

♀.—Length about or nearly 12 mm.

Black, with the hind margins of the tergites very broadly pale yellow (stramineous), with a narrow band of red at the junction with the black. Head very broad, orbits diverging below, clypeus very convex, black, exposed, densely punctured; supraclypeal area with a highly polished space; middle of labrum with red hair; middle of mandibles rufescent above; flagellum bright ferruginous beneath except basally; hair of head long and white; hair of thorax very pale fulvescent above, reddest on scutellum, on pleura it is white anteriorly, but dark brownish grey posteriorly; it is not dark on hind part of thorax or base of abdomen; mesothorax shining in middle; tegulæ testaceous. Wings strongly brownish; basal nervure falling short of nervulus; second cubital cell very broad. Abdomen beyond the first tergite with a fine pale yellowish tomentum, the hair at apex red; venter with pale red hair; middle and hind legs and front basitarsi with dark hair.

Transvaal: Louis Trichardt, April 4–10, 1 ♀ (*A. M.*).

Evidently distinct from *E. ruficollis* Friese, which is known only in the male, by the smaller size and colour of hair on legs. Compared with *E. laticeps* Friese it is considerably smaller and does not have the dark hair on hind part of thorax and base of abdomen. In *E. laticeps* the hair on inner side of hind tibiæ and tarsi is rufescent, but it is dusky red posteriorly in *E. straminea*, which also has a spot of bright red hair at end of middle tibiæ. In both species the front femora have a white fringe.

XIII.—*On the Type-locality and Synonymy of* Ochotona pusilla (*Pallas*). By J. L. Chaworth-Musters.

Most works on the nomenclature of mammals give the type-locality of *Ochotona pusilla* as " the Volga steppes," S.E. Russia, or some other vague and indeterminable locality between the Volga River and the Atlas Mountains. Another mistake which has crept into zoological literature is that the original description of Pallas's *Lepus pusillus* is to be found in the 'Glires,' p. 31, 1778 Reference to 'Glires' shows that Pallas had previously described this animal 1769 in Nov. Comm. Sci. Petrop. vol. xiii. p. 531. (This reference is given in Sherborn's 'Index Animalium.') Again, on the same page of the 'Glires' a reference is given to 'Itinerarii' (Pallas's 'Reise'), vol. i. p. 155. On looking up this last reference one finds a description of the habits "eine Arf Zwenghasen" and the following footnote: "Mann sehe dessen Abbildung unter dem Namen *Lepus minutus* in den Abhandlung der Kayserlichen Akademie der Wissenschaften." There can be little doubt that *Lepus minutus*, although it is used frequently in the text of the 'Reise,' is a misprint for *Lepus pusillus*. In support of this it may be noted that Schreber ('Säugethiere,' Th. 4, p. 906) gives it as a synonym under his description of *Lepus pusillus*. And, further, we must regard this footnote as referring to the original description in Nov. Comm. Sci. Petrop. Now, at the point in the text of Pallas's 'Reise,' which takes the form of a diary, where the habits of this animal are described, Pallas was staying at Samara in April 1769, and he points out that this animal was one of the most interesting inhabitants of the neighbourhood. In the original description of *Lepus pusillus* he says in regard to this and other animals " observavi hac ipse hyeme," and further on gives the locality as " in campis circa Volgem." Although "hiems" is usually taken to mean winter, it must, I think, here refer to early spring, and we must take " hac ipse hyeme " as meaning the early spring of 1769. In the description of *Lepus pusillus* in 'Glires' (*loc. cit.*) one of the first localities given is " inter Kamam et Samaram satis frequens." From this evidence it seems obvious that the specimen or specimens of *Ochotona pusilla* described by Pallas came from the neighbourhood of Samara, which must in future be regarded as the type-locality.

The synonymy may be arranged as follows :—

Ochotona pusillus (Pallas).

1769. *Lepus pusillus* Pallas, Nov. Comm. Sci. Petrop. vol. xiij. p. 531.
1771. *Lepus minutus* Pallas, Reise, vol. i. p. 155 (footnote).
1795. *Ochotona pusillus* Link, Beytr. Nat. vol. i. (2), p. 74.

Type-locality.—Samara. Samara Govt., S.E. Russia.

MISCELLANEOUS.

The Rôle of the Mite, Eriophyes cheriani *Mass., in the Cephalonion Gall of* Pongamia glabra *Vent.*

To the Editors, 'Annals and Magazine of Natural History.'

SIRS,—Kindly allow me to correct certain inaccurate statements occurring in a recent paper published in your 'Annals' (ser. 10, vol. xi. no. 62, p. 201, Feb. 1933) by Mr. A. M. Massee, of the Research Station, East Malling, Kent, on "A new Species of Gall-mite from South India." Mr. Massee records therein that Mr. M. C. Cherian, Assistant Entomologist, Agricultural College and Research Institute, Coimbatore, South India, submitted to him for identification a new species of mite, now named, after the collector, *Eriophyes cheriani*. On the authority of Mr. Cherian the author records that the mite is responsible for the formation of the curious *cephalonion* gall on the leaflets of *Pongamia glabra* Vent.

Here I beg to bring to your notice that this statement is inaccurate. The new species of mite is not the gall-maker. Its presence in the gall is not denied here. I have also noted it on several occasions. I have been working on the subject of galls ever since 1926, and my collection is the largest from the South Indian regions (from which quarter the new mite hails). Part of this collection is now deposited in the Indian Museum, but the great bulk of it still remains with me.

This extensive collection of mine includes the curious gall on *Pongamia glabra* Vent., alleged, though quite erroneously, by Mr. Charian to be produced by the new mite. I have described the identical gall under the name "polyp gall" (on account of its being a pedunculated outgrowth) in a memoir now with the Asiatic Society of Bengal. I am also exhibiting the very same gall in the coming meeting of the Society. I have reared out from this gall a minute Cecidomyid, as yet undescribed, which alone is the true gall-maker. This fly is in my collections of gall-makers, now in the Indian Museum. Undetermined species of Chalcid and Proctotrypid parasites of the Cecidomyid have also been reared out by me. I am now studying the Cecidomyid in the Indian Museum with a view to describing and naming them.

Again, the same gall on the leaflets of *Pongamia glabra* is found in the Indian Museum in one of the collections of Dr. Annandale, from the Chilka Lake regions in the Madras Presidency, South India. Numerous Cecidomyid flies are preserved along with the galls, and labelled as having been reared out by him from the galls. This occurs in a small collection of undetermined Cecidomyids which I have now undertaken to identify. I have already examined the flies from *Pongamia glabra* leaflet-galls in my own and in Dr. Annandale's collections,and find them to be incontrovertiblyidentical.

The Cecidomyid was reared out not on one occasion only, but on many, in Tanjore, Coimbatore, etc., in South India, and again in Kidderpore, in Calcutta, so that there is absolutely no doubt as to the true gall-maker, which is a Cecidomyid. The galls noted by Mr. Cherian, and illustrated in the plate in the paper mentioned above, are identical with those in my own and in Dr. Annandale's collections, so that there is not a confusion of two distinct galls. The Acarus now named *Eriophyes cheriani* is not the true gall-maker, but only a secondary organism which temporarily inhabits the galls on the leaflets of *Pongamia glabra.* There is nothing strange in this. Every normal organ of a plant has its own Arthropodous enemy, and the abnormal organ, the gall, is no exception to this. Galls have their own borers, miners, etc. In the very same gall on the leaflets of *Pongamia glabra* I have noted a Tineid and a Gelechiad larva boring and pupating. In fact, galls have quite a little but very interesting fauna of their own, consisting of ants, beetles, mites, spiders, pseudoscorpions, etc. The larva of *Dactylethra candida,* for instance, forming the very common shoot-gall of *Tephrosia purpurea* in South India has a pseudo-scorpion predaceous on it. An undetermined ant inhabits the hollow shoot-galls of *Acacia leucophlœa* Willd. after banqueting off the grub of the weevil (*Sphadasmus brahminus* Pas.), which is the true gall-maker. The larva of *Eublemma bifasciata* Moor. has been noted by me to be boring in the gall on the leaves of *Rivea hypocrateriformis* Choisy, produced primarily by a Cecidomyid, as yet an undescribed novelty. The curious habits of *Cecidipta excœariœ,* which lives in the galls of a Chermes on the Argentine plant *Excœariœ biglandulosa,* are well known (Berg., 1878, Ent. Zeit. Stettin, p. 230).

In the case of the galls on *Pongamia glabra,* the Cecidomyid lays eggs on the underside of the leaflets, and the larvæ, on hatching out, give rise to the galls*. The mites wander, sometimes in thousands in dry weather, on the plants. Contact, moisture, and darkness-loving habits take them to the cavity of the gall. By this time the adults of the Cecidomyid have already escaped, leaving large holes on the surface. The mites then inhabit the gall-cavity, finding both food and shelter from the downward-pointed, now shrivelled-up hairs lining the cavity of the gall.

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* Since this was written, additional evidence collected a year ago was re-examined. That the true gall-maker is the undescribed Itonid

I should be highly obliged if you will kindly bring these facts to the notice of other workers by publishing this in your valued pages.

I beg to remain, Sirs,
Faithfully yours,
M. S. Mani.

Entomology Section,
Zoological Survey of India,
Indian Museum, Calcutta.
2 March, 1933.

Sirs,—With reference to the criticism of Mr. Mani regarding the mutual relationship of *Eriophyes cheriani* Mass., the new Cecidomyid, and the galls on *Pongamia glabra* Vent., the writer is not in a position to write authoritatively in the absence of facilities for studying the subject. It was made clear in the paper in question that the writer, whilst taking full responsibility for the description of the mite, was indebted to Mr. Cherian for information regarding its incidence.

The question whether the Cecidomyid is the primary cause of the gall and the mite a secondary infestation, or *vice versa*, can obviously only be settled by observation on the spot, and must be left to those in a position to carry this out.

Since both organisms, apparently, are usually found in the gall, it may be necessary to determine which of them is capable of producing it in the complete absence of the other.

To avoid undue delay this comment is made prior to further communication with Mr. Cherian.

I remain,
Yours faithfully,
A. M. Massee.

East Malling Research Station,
East Malling, Kent.
24 March, 1933.

is proved by the fact that the galls have been artificially produced in the laboratory with the Itonid alone on a pot-grown plant of *Pongamia glabra* Vent. on three different occasions. The midges reared out of the material collected on the field were confined with the leaflets of *Pongamia* in a tight-fitting glass tube properly supported. Their mating and oviposition were watched. After oviposition they died and were removed. The position of their eggs was marked on the leaves. In course of twelve days minute galls began to appear on the leaves. These reached maturity in about two and a half months' time. In this case the mites were never observed in spite of the most careful microscopic examination of the interior of the gall. The Itonid larva was alone present. Detailed accounts of the life-history and description of the Itonid will be given later on pending a thorough investigation.—*April 25th*, 1933.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 68. AUGUST 1933.

XIV.—*South African Bees of the Genus* Anthophora.

By T. D. A. COCKERELL.

THE African species of *Anthophora* are arranged by Friese in several groups. The group of *A. basalis*, at the present time, includes about eight species. The group of *A. acraensis*, with quite a distinctive appearance, is rich in species and is essentially tropical. The group of *A. cœrulea*, which is certainly artificial, has more than a dozen species. The group of *A. quadrifasciata*, much the largest of all, is spread all over Africa, and is equally common in Asia and southern Europe. The present paper deals with South African species which fall in the group of *A. quadrifasciata*, as understood by Friese. *A. quadrifasciata* Vill. is the type of the subgenus *Amegilla* Friese. A close study of these insects shows that minor groups may be recognized. In particular the group of *A. vestita* Smith stands apart from the typical *quadrifasciata* series. The males have a broad black brush of hair on the apical joint of middle tarsi, and the supraclypeal mark is a transverse band, never angulate above. In the restricted group of *A. quadrifasciata* the supraclypeal mark is triangular. In the Palæarctic region many species have the brush on the middle tarsi, and the band-like supraclypeal mark may be found in various forms, such as *A. vulpina* Panzer, *A. pachypoda* Ckll., and *A. crinipes* Smith. It is thus apparent that the *A. vestita* group is not peculiar to S. Africa any more than the restricted group of *A. quadrifasciata*. These two minor groups have produced some curiously similar forms in S. Africa. Thus *A. capensis* Friese, a member of the *A. quadrifasciata* group proper, is red-haired and at first sight looks like *A. vestita*.

Many of these insects are extremely variable, so that it is difficult to say without precise biological observations how many species and subspecies are represented. The orange-red hair of the thorax is highly characteristic of some species, especially in the female, but in others this disappears or is restricted to the region about the base of the wings. There is good reason for thinking that in some cases the red- and grey-haired forms are conspecific, representing Mendelian alternatives. Supposing this to be the case, it is easy to understand why characters may be specific, racial, or merely individual in various populations homozygous or heterozygous for them. Thus it would not be possible on mere inspection to ascertain the taxonomic status of an individual in the absence of biological data. In the case of *A. greyæ* it may be supposed that it is not a subspecies of *A. vestita* since it occupies the same territory, but it may be a species or an individual variation.

These bees nest in colonies or towns, and it is very desirable to obtain good series from single colonies, showing whatever variations may exist. Opportunity may be taken at the same time to collect the various parasites.

In other countries it has been found that species of *Anthophora* especially visit and collect pollen from particular flowers. Thus in the Palæarctic region there are species to be looked for at flowers of *Anchusa, Stachys, Salvia, Echium, Teucrium,* &c. This oligotropism is doubtless found among the African species, and it is likely that those which appear to be of restricted distribution are oligotropic, those of very wide distribution polytropic. Owing to oligotropism it is possible for bees in a single locality to break up into races, and eventually species, ceasing to compete with one another.

The types of the species described below will be placed in the British Museum.

Anthophora albopictula, sp. n.

♂.—Length about 11 mm., anterior wing 9.

Robust, black, including legs (apical margin of trochanters reddish); scape white in front, flagellum shining black; face not hairy; clypeus white, at upper end with a pair of large black marks, shaped rather like a human foot, with the toe sharply pointed (along the lateral suture), the bases above the heels meeting on clypeal margin above (leaving a wedge-shaped extension of the white), or these black marks may be smaller and more irregular, not meeting above; supraclypeal mark a very narrow band, not at all angulate above; lateral white marks filling space between clypeus and eye, ending above at level of supraclypeal mark on inner side, but on outer extended a short distance up orbital margin; basal half of mandibles externally white; labrum white, strongly punctured, with a black spot at each side above; region between antennæ dull. Head and sides of thorax with white hair, but thorax dorsally with pale fulvescent hair not mixed with black, at sides of metathorax it is white; mesothorax and scutellum densely and finely punctured, the mesothorax more or less shining on posterior disc; tegulæ pale testaceous. Wings hyaline, brownish along the veins; basal nervure meeting nervulus; second cubital cell receiving first recurrent nervure beyond middle. Legs with white hair, on outer side of hind tibiæ all white, rather thin, in some lights with a faint golden lustre; no dark streak below knee-plate; hind basitarsi with white hair on outer side but black on inner; white fringe behind anterior femora very long; small joints of hind tarsi varying to rufous; mid-tarsi with no black brush. Abdomen broad, dullish, first tergite with long white hair; tergites 2 to 6 with white hair-bands, but short thin black hair on the part before the bands; apex with a pair of straight reddish or black teeth, about as far apart as the width of one; middle of venter with a conspicuous brush of pale hair.

S. Rhodesia: Vumba, Umtali, May 23–26 (*J. Ogilvie, Alice Mackie*).

A striking species, unlike any of the few S. African ones with white face-markings. The apical armature of the abdomen is exactly like that of the much smaller *A. torridella* Meade-Waldo.

Anthophora aspergina, sp. n.

♀.—Length about 11 mm., anterior wing 8.

Face-marks light yellow, consisting of the broadly triangular supraclypeal mark, slender reversed T on clypeus (the arms enlarged at ends), lateral marks (consisting of a band along clypeal margin, not reaching upper end), basal half of mandibles, and labrum (except basal margin and two shining spots); antennæ black; hair of head mainly white, thin on face, long and pure white on cheeks, pale fulvous on top of head, mixed with black, a very large dense tuft between middle ocellus and lateral ones, so that from the front the latter are not visible; mesothorax and scutellum dull; thorax above with hair mixed very pale fulvous and black, clear bright fulvous below and in front of wings, white on lower part of pleura and on metathorax; tegulæ bright rufo-fulvous. Wings brownish hyaline, basal nervure meeting nervulus. Legs black, with mostly whitish hair; on inner side of tarsi it is a sort of purplish brown, shining bright orange in certain lights, and on hind basitarsi varying to black; mid-basitarsi posteriorly with a fringe of pure white hair; tibial scopa of hind legs white or yellowish white (collecting bright orange pollen of Compositæ), with a short black stripe below knee-plate; hind basitarsi with light hair on basal part, but apically black; first tergite with very pale fulvous hair, mixed with black on disc, and with an apical pale fulvous-tinted band; tergites 2 to 4 sprinkled all over with greyish hair, and with rather broad apical bands, the first yellowish, the others whiter; fifth tergite with a large black patch, but sprinkled with pale hair otherwise, and with long pure white hair at sides; venter with bright red hair in the subapical region. Spurs black, hind spur of hind tibia curved.

Natal: Ingogo, 4064 ft. alt., March 21–22, 2 ♀ (*J. Ogilvie*).

Looks very like *A. spilostoma* Cam., but easily distinguished by the sprinkled abdomen, with the bands less evident. There is much resemblance to *A. leopoldi* Ckll., from the Kivu district of Central Africa, the differences being in fact only in minor details, such as the lack of black hair in the region before the wings, the greenish-grey eyes (deep red in *leopoldi*), and the bright fulvous hair at sides of thorax above. It is astonishing to find these insects so very closely related, yet nearly 2000 miles apart.

Anthophora capensis Friese.

Natal: National Park, March 3–15 (*J. O.*).

S. Rhodesia: Vumba, Umtali, May 23–26, much worn (*J. O.*).

Orange Free State: Ficksburg (*L. O.*, *J. O.*).

S. Rhodesia: Shangani, De Beers Ranch (*A. M.*).

Although this species looks just like *A. vestita* the male has no brush on last joint of mid-tarsi and the supraclypeal mark is angulate above. The species is therefore not of the *A. vestita* group.

Anthophora cerealis, sp. n.

♀ (type).—Length about 11 mm., anterior wing 9.

Robust, black, including antennæ (the scape may have a minute yellow dot) and legs; face-marks light yellow, consisting of a hat-like supraclypeal mark (a high triangle, with linear extension at each side), a reversed T on clypeus (median band broad, narrowed above, apical band narrow), broad lower corners of clypeus (but no lateral face-marks), greater part of outer face of mandibles, and the very large rugose labrum (narrow basal margin and lateral spots black); hair of head and thorax dull white, dark brown on vertex, and sparsely mixed with black on disk of mesothorax; mesothorax entirely dull; tegulæ light rufo-testaceous. Wings hyaline, with dark nervures; basal nervure falling short of nervulus; second cubital cell receiving recurrent nervure much beyond middle. Legs with white hair, rusty black on inner side of hind tibiæ and tarsi; hind tibia with white hair on outer side (no black streak from knee-plate); hind basitarsus the same except the black-haired apex, which projects far beyond the insertion of second joint; hair on inner side of front tarsi chocolate-colour. Abdomen with apical margins of tergites pallid and covered with broad bands of pure white hair; tergites before the bands bare, with a little black hair; fifth tergite with dark chocolate hair, but white at sides.

♂.—Similar, but clypeus yellow, with a pair of widely separated parallel black bars on upper part; face with much white hair; scape with a pallid stripe on outer face, but it is brownish and obscure; middle tibiæ and tarsi with pure white hair on outer side and black on inner, but no tarsal brush; the tibia toward the end in front has a little tuft of bright red hair; hind tibiæ with pure white hair on outer side, but the basitarsi black-haired on both sides except a little tuft of white at extreme base; spurs black.

Cape Province: Ceres, Feb. 12–18, 2 ♀, 1 ♂ (*J. Ogilvie*).

The female is exceedingly similar to *A. erytrina* Friese, which I have from Kona, Ashanti (*J. J. Simpson*). *A. erytrina* differs by the considerably narrower abdominal bands, the long black stripe below the knee on hind tibiæ, and the lateral face-marks. From *A. spilostoma* Cam. *A. cerealis* is readily known by the pure white abdominal bands and the total absence of pale hair on the fourth tergite before the band, as well as the differently coloured hair on hind legs. The nearest relative is doubtless *A. niveata* Friese, which has similar markings on the male clypeus. The female differs from *A. niveata* by the total absence of fulvous hair on thorax, and the male by the eyes being red instead of pea-green. Nevertheless, the insect should perhaps be regarded as a race of *A. niveata*. From Paarl Mountain, Feb. 9 (*J. Ogilvie*), comes a peculiar male which is more or less intermediate between *A. cerealis* and *A. niveata*, but must be referred to the latter. It is larger and more robust than typical male *A. niveata* (from Willowmore), with plenty of light fulvous hair in region of wings and beyond, so that it looks exactly like a female. The scape is broadly yellow in front, the eyes are red, and the clypeus has two very large elongate black marks, wider than the yellow band between them. The hind basitarsi are all black except for the small white tuft at extreme base. This has enough characters to be regarded as a distinct subspecies or even species were it constant in any region, but it is probably a variant form. It may be known as *A. niveata* var. *amphigynops*, nov. Typical *A. niveata* (from Willowmore) has red eyes in the female and green in the male. The males at Graaff-Reinet are similarly green-eyed. In the American Anthophorid *Centris cæsalpiniæ* Ckll. the eyes are crimson in the female, olive-green in the male.

Anthophora circulata (Fab.) (*caligata* Gerst.).

S. Rhodesia : Christmas Pass, Umtali (*J. O.*, *L. O.*).

Both sexes were taken, and they are exactly *A. circulata* as found in the Equatorial region. Thus a male precisely matches one from Kabare on the south shore of Lake Edward. The original insect of Fabricius came from Guinea. *A. caligata* was from Zanzibar. The so-called *A. circulata* found by Brauns at Willowmore is different, and is apparently to be called *A. alboscopacea* (Friese).

In the Belgian Congo we took *A. circulata* at Dilolo, Tenke, Elisabethville, south of Bukavu, Uvira, and Albertville, as well as at Kigoma and Ujiji in Tanganyika Territory.

The bee described below, from Natal, was at first thought to be separable, but I now consider that it must be included in *A. circulata.*

♀.—Length about 10 mm., anterior wing 8.

Black with very pale yellow face-marks, consisting of a very broad triangular supraclypeal mark, a reversed T on clypeus (the stem broad, the arms enlarged at end), lateral face-marks consisting of bands along clypeal margin, basal half of mandibles, and the large labrum with two basal spots ; antennæ black ; hair of head mostly very pale fulvous, pure white on cheeks below, lower side of face, and labrum, mixed with black on vertex ; thorax above with pale fulvous hair mixed with black (including all of scutellum), clear light ferruginous at sides in region of wings, and dull white on sides below ; tegulæ shining rufo-testaceous. Wings brownish ; basal nervure meeting nervulus. Legs black, mainly with pale hair, the hind tibial scopa white or nearly so, with a blackish streak below knee-plate ; hind basitarsi with long white hair on basal half, black beyond ; hair on inner side of hind basitarsi black, obscurely reddish in some lights. Abdomen with four broad pale hair-bands, the first three fulvescent, the fourth white; the region before the bands with black hair, except at extreme sides; fifth tergite with the usual black patch, but otherwise clothed with white hair; sternites with red fringes, white at sides.

Natal: Ingogo, March 21–22 (*J. Ogilvie*).

Anthophora elimata, sp. n.

♂.—Length about 12 mm., anterior wing nearly 11.

Robust, black, including legs, the flagellum very faintly reddish beneath; face-marks rather bright yellow (the face shining), including broad stripe on scape, supraclypeal band (not angulate above), lateral marks filling space between clypeus and eye (the outline concave above, with a slender extension up orbit), clypeus except two large black marks (leaving a rather broad yellow band between, the lower edge of the black produced and rather narrowly rounded, the sutural extension linear), labrum (except two rather small and pallid spots, and the whole surface covered with very short white hair), and very large oblong marks on mandibles; head with white hair, but face bare, white hair beneath head very long and abundant; hair of thorax white, dorsally suffused with pale fulvous (not mixed with black), but white posteriorly on scutellum; mesothorax dull and densely punctured, a little shining between punctures on disk; tegulæ large, testaceous. Wings hyaline, reddish along the veins; basal nervure meeting nervulus. Legs with white hair, bright ferruginous on inner side of tarsi; mid-tibiæ with a little tuft of golden hair near apex in front; last joint of mid-tarsi hardly enlarged, but with a broad black brush on each side; hind trochanters with long dusky hairs; spurs dark, the posterior spur of hind legs expanded into a broad lamella, which is angulate behind; between the spurs is a tuft of long dark hair; hair on outer side of hind tibiæ dense and silky white, on outer side of their basitarsi all white, but thin, with a tuft of long white hairs at base. Abdomen bare, with very scanty black hair, except the pure white hair-bands, very weak on first tergite, strong and entire on tergites 2 to 5; apical teeth short and not far apart; venter reddish.

S. Rhodesia: Matopo Hills, April 17–30 (*J. Ogilvie*).

A species of the *A. vestita* group, but peculiar in the spurs and apical teeth of abdomen. The clypeal marks resemble those of *A. infracana* Ckll., but are smaller and not so close together; the lateral marks differ strongly from those of *A. infracana*, being extended up to the vicinity of the supraclypeal band. The clypeal marks are shaped much as in female *A. matopensis* Ckll., but the difference in the abdomen is so great that I cannot believe *A. elimata* to be its male.

Anthophora fulvodimidiata Meade-Waldo.

Portuguese East Africa: Porto Amelia, June 7 (*A. M.*, *L. O.*).

Quite the same as specimens from Dilolo, Katanga.

Anthophora greyæ Cockerell.

Orange Free State: Ficksburg, Feb. 26–March 1; males (*J. O.*, *L. O.*).

Cape Province: Lady Grey (*R. I. Nel*).

This is so close to *A. vestita* Smith that it may represent an extreme case of dichroism parallel with that of *A. natensis* Ckll. and its variety *ferripicta* Ckll. One would be inclined to suppose it to be a desert race or species, with the characteristic pale coloration, but, as a matter of fact, both sexes of true *A. vestita* were taken at Ficksburg (*J. O.*, *A. M.*) and male *vestita* was taken at Lady Grey.

A further complication arises in reference to *A. pallidicincta* Cameron. Brauns saw the female, and said it was *A. vestita*; but the true type was a male, and it may not be separable from *A. greyæ*, though Cameron makes no mention of any broad black brush on middle tarsi.

The form described below was at first thought to be distinct on account of the different marking of the clypeus, but it is certainly no more than a variation.

♂.—Length about 13 mm., anterior wing 9·4.

Rather elongated, black, including legs; antennæ black, the scape with a small yellow mark or a conspicuous stripe; mandibles with a basal yellow mark; labrum pale yellow, with much long white hair and a black spot at each side of base; lateral face-marks large, broadly emarginate above; clypeus shining yellow, the lower margin narrowly rufous, the upper part with two large widely separated marks, the upper part broad and subquadrate, pointed below, but the sutural side prolonged downward as a narrow band almost to the orbit. Head and thorax with long abundant white hair, but a band of black hair behind ocelli and a peculiar black tuft above each eye, while black hairs are plentifully interspersed on mesothorax and anterior part of scutellum ; mesothorax and scutellum dull, the former with a shining discal space; tegulæ rather small, light rufo-testaceous. Wings rather strongly brownish ; basal nervure meeting nervulus ;. second cubital cell receiving first recurrent nervure beyond middle. Legs with white hair, pale reddish on inner side of tarsi, small joints of tarsi rufescent ; last joint of mid-tarsi with a broad black brush ; first tergite with long white hair, a few dark hairs mixed on apical part ; tergites 2 to 4 conspicuously clothed with thin grey hair, and with rather broad apical hair-bands, which are faintly yellowish but pure white at end ; fifth and sixth tergites with broad white hair-bands, and a little black hair on basal part ; apex with two widely separated short teeth, and no little tooth between ; venter more or less reddish.

Natal : National Park, March 3–15 (*J. Ogilvie*).

Cape Province : Huguenot, Feb. 5–10 (*L. Ogilvie*).

The wing-venation is lighter and more delicate in the Huguenot specimen. The narrow supraclypeal mark is short, being only as long as the width of the median stripe. The labrum has a little bifid tubercle at the apex.

There is a superficial resemblance to *A. braunsiana* Friese, but the thorax is much less robust, the yellow band in middle of upper part of clypeus is very much broader, and the abdomen is quite different.

A. griseovestita is very like the insect described above, but smaller (male about 10 mm.), and has similar clypeal markings. It is probably a form of the same species.

Without coming to a definite conclusion I think we shall have to write (1) *A. vestita* Sm. ; (2) *A. vestita* var. *pallidicincta* (Cam.), syn. *greyæ* Ckll. ; (3) *A. vestita* var. *griseovestita* (Ckll.).

Anthophora grisella Cockerell.

Orange Free State : Ficksburg, both sexes, Feb. 26–March 1 (*L. O.*, *J. O.*, *A. M.*) ; Gum Tree, Feb. 29 (*A. M.*).

The females are uniform and typical, but the series of males is puzzling. What I regard as the more typical male *grisella* has the clypeus black, with a median light stripe, as in the female. The original type was a female ; the male described with it had a marginal stripe on clypeus, but is not, I am sure, a different species. One of the Ficksburg males has dark tegulæ. Other Ficksburg males, having the apical yellow band on clypeus, can be divided into two groups :—(*a*) hair of thorax above white, not mixed with black ; no red or fulvous hair on thorax ; basal part of flagellum with or without a large red spot ; and (*b*) hair of thorax above strongly mixed with black ; sides of thorax, below wings, without black hair ; thorax with some fulvous hair ; hind tibiæ with long black hair on inner side, but red or pale posteriorly and white externally, flushed with fulvous in front. Of these the second (*b*) seems to be the Natal *A. fallax* Smith, but to be excluded from that species if Sierra Leone is taken as the type-locality. The first (*a*) may be a hybrid between this insect and *grisella*.

The description of *A. felina* Friese, except for the brown antennæ, agrees very closely with *A. grisella*, and must at least represent a closely allied species ; but Friese says *A. felina* is extremely like *A. antimena* Sauss., perhaps no more than a race. Now *A. grisella* does not suggest *A. antimena* particularly, but is superficially exactly like *A. albigena* Lep., a fact which Friese could hardly have failed to notice.

What I have determined as *A. rufolanata* Dours is the S. African species which seems to me most like *A. antimena*, at least in superficial appearance.

Anthophora infracana, sp. n.

♂.—Length about 11 mm., anterior wing 8.

Black, with yellow face-marks (not very bright), consisting of broad stripe on scape, transverse supraclypeal band (not at all angulate above), triangular lateral face-marks (pointed above on orbits, the broad upper side only moderately concave in outline), clypeus except two large black marks above, separated by a narrow stripe (these marks rounded below, with concave lower margin, and pointed on suture), and large spots on base of mandibles ; labrum yellowish white, with the usual two spots, and thickly covered with long white hair; head with mostly white hair, but pale fulvous on upper part; mesothorax dull and densely punctured, the median groove strong; mesothorax and region of tubercles with bright ferruginous hair, a little black in front of scutellum, which has long pale fulvous hair; on lower parts of thorax and posteriorly the hair is white but dullish, not pure white as on cheeks; tegulæ rufo-testaceous. Wings very faintly brownish; basal nervure meeting nervulus. Legs black, with white hair, yellowish in front of middle tibiæ; all pale on outer side of hind basitarsi, but on inner side very bright ferruginous, a tuft of very long white hairs externally at base; middle tarsi with last joint broad and thick, having a black brush on each side. Abdomen very broad, first tergite with long pale fulvous hair, whiter basally, and a rather narrow marginal white hair-band; tergites 2 to 4 with very broad, dense, pure white hair-bands; before the band the second tergite has thin pale hair mixed with dark, the others have more dark or black hairs. Eyes red. Spurs red, normal.

Transvaal: Louis Trichardt, April 6–7 (*L. Ogilvie*).

Related to *A. vestita* Sm., but with peculiar face-marks, in which the margin of the clypeal black below forms a nearly continuous line with the upper edge of the lateral marks at an angle of about 50 degrees with orbital margin. Considering the apparent variability of *A. vestita* this might be considered a race or variety, but it appears to be distinct.

Anthophora lusoria (Cockerell).

S. Rhodesia: Matopo Hills (*A. M.*, *J. O.*, *L. O.*).

Described as a race of *A. oldi* M.-W., but apparently a distinct species.

Anthophora matopensis, sp. n.

♀.—Length about 14 mm., anterior wing 10·3.

Black, robust, with yellow face-marks, consisting of large elongate-oval spots on base of mandibles, very broad apical band on clypeus, strongly incised on each side of middle, and a narrow median stripe on clypeus, joining the band; no lateral face-marks; antennæ entirely black; eyes red; facial quadrangle about square; labrum of moderate size, light yellow, with two large black spots; upper part of head with light reddish-fulvous hair, face with white, slightly fulvescent, cheeks (except at upper end) with pure white; mesothorax and scutellum dull and densely punctured, the scutellum a little shining at anterior middle; thorax above with dense bright orange-fulvous hair, mixed with black on posterior disk of mesothorax and anterior part of scutellum; sides of thorax with white hair, becoming fulvous above; tegulæ light rufo-testaceous. Wings brownish; basal nervure meeting nervulus; second cubital cell broad. Legs black, with mainly white hair; anterior tarsi with a large greyish-black fringe behind; mid-tibiæ and basitarsi with black hair on inner side, and that of small joints of tarsi black, the tibiæ with reddish hair posteriorly; hind tibiæ with a very broad white scopa and a chocolate-brown shade extending below knee-plate; on the inner side the tibiæ and basitarsi have black hair somewhat suffused with reddish; hind basitarsi externally with white hair, except the apical third or fourth, where it is black. Abdomen broad, thinly covered with grey tomentum, not hiding the surface; first tergite with long white hair on basal part, followed by long and abundant reddish and black hair; at apex of first tergite is a very narrow pure white hair-band; tergites 2 to 4 with apical white hair-bands, wider than that on first; fifth tergite with white hair at base and black beyond; sides of venter with white hair.

S. Rhodesia: Matopo Hills, April 17–30 (*Alice Mackie*).

Near to *A. ekuivensis* Ckll. from Angola, with similar face-marks and red hair on thorax, but larger and more robust, with different abdomen. Also very much like *A. bechuanensis* Ckll., differing by supraclypeal mark reduced to a minute dot; clypeus shorter, with median band narrower; face very hairy; labrum smaller, light mark on mandibles much smaller; scape and flagellum all black; light hair at base of first tergite much longer, and long black hair on apical part.

Anthophora natalensis Friese.

Natal: National Park, March 3–15, ♀ (*A. Mackie*).

This agrees well with Friese's description, but it should be added that the hair on outer side of hind tibia and basitarsus is pale reddish anteriorly, whitish posteriorly (Friese simply says whitish), and when the hind leg is seen from behind (or within) the tibia and base of basitarsus show a fringe of white hair posteriorly and lively red hair anteriorly. The supraclypeal mark is triangular. This appears to be a mountain species. Bulwer, the type-locality, has an altitude of about 5100 ft.

Anthophora niveata Friese.

Cape Province : Stellenbosch, Nov. 7 (*R. I. Nel*).

Anthophora niveata var. *amphigynops*, nov.

See under *A. cerealis*. Paarl Mountain.

Anthophora ogilviei Cockerell.

S. Rhodesia : Shangani, De Beers Ranch (*J. O.*, *A. M.*) ; Christmas Pass, Umtali (*A. M.*, *J. O.*, *L. O.*) ; Vumba, Umtali (*J. O.*, *A. M.*) ; Battery Spruit, near Umtali, May 19 (*A. M.*).

Transvaal : Louis Trichardt (*J. O.*) ; Yokeskei R., Johannesburg, March 31 (*J. O.*).

Anthophora rubricans Cockerell.

Cape Province : Stellenbosch, Nov. 7 (*R. I. Nel*) ; Ceres, Feb. 12–18 (*J. O.*) ; Mitchell's Pass, Ceres, Feb. 9–17 (*A. M.*) ; Paarl Mountain, both sexes, Feb. 9 (*J. O.*) ; Huguenot, both sexes, Feb. 5–10 (*J. O.*, *L. O.*, *A. M.*) ; Devil's Peak (*C. K. Brain*) ; Van Rhyn's Pass (*J. O.*). The last two (males) I had placed under *A. fallax* Sm.

The original description (1932) included only the female. The male is very similar, and agrees in having conspicuous black hair in the region of the tubercles and below the tegulæ. The face-markings are similar, but the scape has a yellow stripe, and the apical band of clypeus, though narrow, is entire. The lateral face-marks are much larger, somewhat V-shaped. The abdominal bands are not so red, and the hind basitarsi are covered with light hair on outer side and bright ferruginous on inner. In a key to males with much black on clypeus this falls in a group with light hair covering outer side of hind basitarsus, clypeus with a marginal yellow band, and hair of thorax above strongly mixed with black, and is finally separated by the black hair on upper part of sides of thorax. The hind basitarsi, as in *A. grisella* Ckll., have on inner side a tuft of long hair near base, and beyond this a low dark ridge which consists of short strongly plumose hairs closely appressed, with the margin quite even, though elevated at the basal end. This is not in itself a specific character, as it occurs in various species, and is very distinct in the Indian *A. niveocincta* Smith. Nevertheless, in other species the arrangement is quite different. Thus in *A. albida* Dours the inner margin presents a rather loose fringe of black hairs from one end to the other, but longest basally.

A. spilostoma Cam., as represented in the British Museum, is a very similar species, but with no black hair on upper part of sides of thorax. I had also separated it (female) as being rather smaller, abdominal bands paler, hind tibiæ with no black stripe below knee-plate. I found that the specimen in the Museum marked type did have a black stripe below knee-plate, and the abdominal bands were fulvous; the tegulæ were light fulvo-testaceous. Cameron's description says the tegulæ are piceous and the two large black marks on clypeus are rounded and narrowed at apex. It is probable that the true holotype is not in the Museum, and at present I am perplexed concerning the proper identification of the species. What I have been calling *A. spilostoma* appears to be distinct from *A. rubricans* and closely allied to supposed *A. fallax* Smith. Cameron's account of the clypeal marks is valid for male *A. rubricans*.

A. fallax was described by Smith (1879) from "Natal, Sierra Leone." It is practically certain that the specimens from these localities were different. Meade-Waldo (1914) considered *A. fallax* to be a subspecies of *A. albigena* Lep., with the Asiatic *A. lucknoviensis* Rad. and *A. albigena quadrata* Ckll. as synonyms. He separated the female from allied species by the tergites 4 and 5 covered with a sparse but distinct black (instead of white) pubescence, thus rather after the style of *A. diloloensis* Ckll. I find no such species in the S. African fauna. It will be best to follow Meade-Waldo's lead, and designate Sierra Leone as the type-locality, though it must be added that the fourth tergite has a white hair-band, as indicated by Smith.

Anthophora vestita Smith.

Cape Province : Ceres (*J. O.*).

Transvaal : Pretoria, Dec. 16 (*J. C. Faure*) ; Louis Trichardt (*L. O.*). See also under *A. greyæ*, which is probably a variety of *A. vestita*.

Anthophora zinniæ Cockerell.

S. Rhodesia : Matopo Hills (*A. M.*, *J. O.*, *L. O.*) ; Shangani, De Beers Ranch, both sexes (*A. M.*, *J. O.*, *L. O.*) ; Christmas Pass, Umtali (*J. O.*) ; Beit Bridge, April 12 (*A. M.*).

Transvaal : Louis Trichardt, female (*A. M.*).

XV.—Balanophyllia annæ, *a new Species of Coral from the Cape Seas*. By C. J. van der Horst, University of the Witwatersrand, Johannesburg.

[Plate VII.]

Prof. T. A. Stephenson, Cape Town, sent me some time ago a small coral for identification. This coral was detected by Mr. C. A. du Toit at Morris Point, Stil Bay, near Cape of Good Hope. About thirty specimens were found in a small pool in a tiny cave on the rocks near low-water level at spring-tides. Most of them were facing upwards, sitting on the bottom of the pool. No specimens were found in any other pool in the vicinity.

The coral appears to belong to the genus *Balanophyllia*, but, as all specimens sent to me were detached from the substratum and one of them shows an appendage which may be a stolon with a bud attached to it, it may ultimately turn out that the coral belongs to Verrill's genus *Rhizopsammia*. The only difference between *Rhizopsammia* and *Balanophyllia* is that the former genus propagates asexually by stolon budding, whereas *Balanophyllia* may show lateral buds attached to the calicle. However, as only one specimen shows a structure which might be a stolon and all the others do not show a trace of this organ, it seems more likely that this coral belongs to the genus *Balanophyllia*.

Verrill described *Balanophyllia capensis* from the Cape of Good Hope. This description is inadequate, and no figure is given, but from the size of this species—about half an inch high—it is clear that the corals sent to me do not belong to this species. They do not conform to the description of any other species, though they come near to *Balanophyllia parvula* described by Moseley from the Philippine Islands. So I will describe these specimens as a new species under the name

Balanophyllia annæ, sp. n.

The coral has an irregularly spreading base from which the calicle rises rather abruptly, so that its diameter near the base surpasses only slightly that near the calicular margin. In the largest specimen the calicle is slightly oval in outline, being 5·6 mm. long and 4·7 mm. broad; the height of the calicle is 3·8 mm. The smaller specimens are even rounder, in young specimens the calicle is quite round.

The outside may be covered with an epitheca; in some of the small specimens this epitheca is complete and reaches up to the calicular margin; but mostly the epitheca is incomplete and reduced to a small patch near the base. The epitheca is always very dense, quite obscuring the ribs, and it is covered with very irregular more or less horizontal striæ.

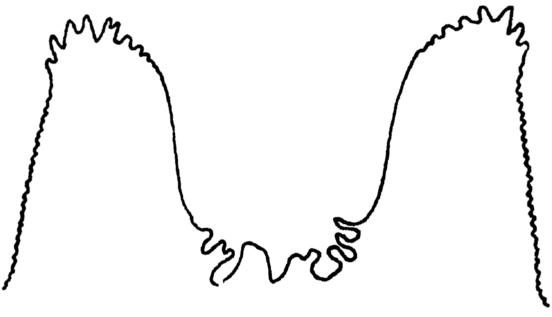

Diagram of a longitudinal section of the calicle of *Balanophyllia annæ*, sp. n.

The ribs are equal or nearly equal. There are about three ribs to 1 mm. They are perforate, densely covered with small irregular granules, and separated by narrow deep intercostal furrows.

The septa are regularly arranged in six systems of four cycles. The septa are thin, thinner than the distances between them, except that the primaries, and to a less extent the secondaries, become thicker towards the calicular margin. Here they are thicker than the interseptal spaces. The primaries are exsert for nearly 1 mm., the secondaries to about half that extent. The quaternaries adjoining the primaries reach to a height slightly less than that of the primaries. The tertiaries are hardly at all exsert. The faces of all septa are densely covered with small granules. The primary septa reach the columella. The quaternaries join two by two in front of the small tertiaries and again in front of the secondaries, separating in this way also the secondaries from the columella. The convex upper edge of the primary and secondary septa is jaggedly dentate, but the almost perpendicular inner edge is entire, except that near the bottom of the calicle they have a few large irregular teeth that fuse, at least in the case of the primaries, with the columella. The edge of the quaternaries is irregularly dentate throughout. The oblong columella is formed by a few irregularly twisted lamellæ.

The living coral is pale orange in colour.

In general appearance this species comes very near to *Balanophyllia regia*, but the latter species is larger and has a much coarser texture.

EXPLANATION OF PLATE VII.

Balanophyllia annæ, sp. n.

Fig. 1. Adult and several young specimens.
Fig. 2. Specimen with stolon-like outgrowth.
Fig. 3. Top view of calicle.
Fig. 4. Side view of calicle.

All figures six times enlarged.

XVI.—*Studies in African* Tachinidæ (*Diptera*).—IV.

By C. H. Curran, American Museum of Natural History, New York.

Five new species belonging to the genus *Actia* Desvoidy have been received from Africa. A key for the separation of the African species belonging to the genus is presented, since that published in Part I. of this series is incomplete.

Key to the African Species of Actia.

1.	First vein bristled on at least the apical third	2.
	Only the third vein bristled	*heterochæta* Bezzi.
2.	Fifth vein bristled above; apical section of first vein bristled below	3.
	Fifth vein without bristles above; first vein usually bare below	13.
3.	First vein bristled on practically its whole length	4.
	First vein bristled on apical third only	*normula* Curran.
4.	Apical cross-vein present	5.
	Apical cross-vein absent; palpi much swollen; ultimate section of fifth vein as long as preceding section	*munroi* Curran.
5.	At least the anterior femora wholly pale.	7.
	Legs black, coxæ and sometimes the lower surface of the anterior femora reddish yellow	6.
6.	Legs black except the extreme knees and coxæ	*hargreavesi*, sp. n.
	Anterior femora and tibiæ reddish on lower surface	*rejecta* Bezzi.
7.	Tibiæ mostly pale in ground-colour	8.
	Tibiæ and tarsi black, the femora all pale.	*chrysocera* Bezzi.
8.	Two strong sternopleurals and a much weaker one below, third antennal segment usually mostly reddish	9.
	Three almost equally strong sternopleurals; third antennal segment mostly blackish	*varichæta* Curran.
9.	Thorax wholly pale, the mesonotum but little darker than the pleura	10.
	Mesonotum and part of the pleura blackish in ground-colour	11.
10.	Abdomen with incisures and interrupted median vitta brown; setæ on underside of first vein much weaker than the dorsal ones	**languidula* Villeneuve.
	Abdomen wholly pale, ventral setæ on first vein practically as strong as the dorsal ones	*pallens* Curran.
11.	The anterior bristle on the middle tibia is situated conspicuously nearer the base than the ventral bristle	12.
	The anterior bristle is only very slightly nearer the base of the middle tibia than the ventral bristle	*cuthbertsoni*, sp. n.
12.	The bare part of the cheeks in the male is wider than deep; third antennal segment subtriangular, not half as wide as long	*buccalis*, sp. n.
	The bare part of the cheek in the male is narrower than deep; third antennal segment about twice as long as wide	*cibdella* Villeneuve.

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* Not seen and ground-colour of mesonotum doubtful.

13.	Mesonotum wholly, almost evenly pollinose	14.
	Mesonotum shining black, with pale pollinose pattern	*spoliata* Bezzi.
14.	First vein without bristles below	17.
	First vein bristled on apical part of lower surface	15.
15.	Femora black	16.
	Femora reddish	*mitis* Curran.
16.	First vein bristled above on whole length.	*ugandana*, sp. n.
	First vein bristled on apical section only.	*nana* Curran.
17.	First vein bristled above on whole length.	20.
	First vein bristled on apical section only.	18.
18.	Posterior cross-vein situated near the middle of the penultimate section of the fourth vein	19.
	Posterior cross-vein much nearer the anterior cross-vein than the bend of the fourth vein	*compacta* Curran.
19.	Thorax wholly yellow in ground-colour.	*luteicornis*, sp. n.
	Mesonotum black in ground-colour	*lavinia* Curran.
20.	Legs black	*nigripes* Curran.
	Legs reddish	*natalensis* Curran.

Actia hargreavesi, sp. n.

First, third, and fifth veins bristled; black, the base of the abdomen broadly red on the sides.

Length 4·25 mm.

♀.—Head whitish pollinose, the occiput above and upper part of the front rather ochreous. Face, cheeks, and front reddish yellow in ground-colour, the parafrontals somewhat brownish. Bristles strong; two pairs of proclinate orbitals. Cheeks two-ninths as wide as eye-height. Third antennal segment brown, its base and the first two segments reddish; arista brown, pubescent, the penultimate section scarcely twice as long as wide.

Thorax black in ground-colour, cinereous pollinose, the dorsum largely brownish ochreous; humeri and free border of the scutellum broadly yellow. Four pairs of post-sutural dorso-centrals; three sterno-pleurals, the lower one three-fourths as long as the others.

Legs black, the tibiæ brown; coxæ and trochanters reddish.

Wings cinereous hyaline, the veins yellow, paler basally; first vein with strong bristles on whole length above and on apical section below; third vein bristled on almost its whole length above and with a single basal bristle below; fifth vein bristled above more than halfway to the posterior cross-vein, the anterior end of which is nearer to the anterior cross-vein than to the bend of the fourth vein. Squamæ white. Halteres missing.

Abdomen shining blackish, the sides of the first segment and basal third of the second very broadly reddish, bases of second to fourth segments narrowly white pollinose, the bands broadly interrupted in the middle. Second segment with a pair of strong median marginals, and on either side two or three weak appressed ones, the third and fourth segments each with a row of strong ones.

Holotype, ♀, Kampala, Uganda, 19. vii. 1927 (*H. Hargreaves*), ex caterpillar on Kiwamera.

Actia ugandana, sp. n.

An unusually slender black species, having the first, and third veins bristled above and the first bristled on the apical section below. It differs from both *mitis* Curran and *nana* Curran in having the first vein bristled on its whole length above.

Length 5 mm.

♂.—Head whitish pollinose; face and cheeks reddish in ground-colour, the cheeks deeper than long, scarcely two-ninths as wide as eye-height. Bristles strong, the second upper frontal very long and strong; two pairs of orbitals; outer verticals three-fourths as long as verticals. Frontal vitta orange. Palpi slender, reddish Antennæ blackish, the third segment a little more than twice as long as wide, its base and the first two segments reddish; arista pubescent, reddish on basal half, its penultimate section four or five times as long as wide.

Thorax black, cinereous pollinose, tinged with brownish on the disc of the mesonotum, the apex of the scutellum luteous. Four pairs of post-sutural dorso-centrals; two sterno-pleurals, the lower absent.

Legs black, anterior coxæ reddish brown; broad apex of anterior femora and all the tibiæ brownish red.

Wings cinereous hyaline; first vein with strong bristles above on whole length, with weaker bristles on apical section below; third vein bristled on basal three-fourths above and with a single basal bristle below. Posterior cross-vein situated only about one and one-half times its own length beyond the anterior cross-vein and more than three times its length from the bend of the fourth vein. Squamæ white. Halteres missing.

Abdomen shining black, in some lights more than the basal half of the second and third segments and the basal fourth of the fourth cinereous white pollinose, the pollinose fasciæ broadly interrupted in the middle. Second segment with a pair of very strong median marginals and two pairs of weak sublaterals, the third and fourth segments each with a row of strong marginals.

Type, ♂, and four ♀ *paratypes*, Kampala, Uganda, 14. ix. 1927 (*H. Hargreaves*), no. 0176 *a*. Paratypes in American Museum of Natural History.

Actia luteicornis, sp. n.

Related to *lavinia* Curran, but with the thorax wholly pale in ground-colour and smaller setæ on the first vein. Length 5 mm.

♂ & ♀.—Pale yellowish, the legs, antennæ, and proboscis reddish yellow. Head white pollinose; frontal vitta reddish yellow; antennæ luteous or orange, very large, the third segment with parallel sides, subtruncate apically, three times as long as wide; penultimate aristal segment three times as long as wide; apical half of arista brown.

Thorax thickly cinereous pollinose. Four pairs of postsutural dorso-centrals; three sterno-pleurals, the lowest one weaker. Tarsi becoming brownish apically.

Wings cinereous hyaline; third vein setose to opposite posterior cross-vein, the setæ strong; first vein with small setæ on the apical third.

Basal three abdominal segments with obscure, rather narrow, median brownish vitta; the abdomen with rather thin whitish pollen, which is somewhat condensed on the narrow bases of the apical three segments. Second segment with a pair of median marginals, the third and fourth each with a row, the second with weak, less erect marginals towards the sides.

Type, ♂, and ♂ *paratype*, Southern Rhodesia, 7. iv. 1918, reared from the larva of a Saturniid moth; *allotype*, ♀, and ♀ *paratype*, Bulawayo, Southern Rhodesia, 20. iv. 1918, ex *Nudaurelia belina* Westw.

Actia cuthbertsoni, sp. n.

First, third, and fifth veins bristled above, the first below; antero-dorsal bristle on middle tibia situated near the apical fourth.

Length 4 mm.

♂.—Head yellowish in ground-colour, whitish pollinose, the occiput brown in ground-colour on almost the upper half. Frontal vitta dull yellowish; ocellar triangle with yellowish pollen; six pairs of frontals, the upper two pairs reclinate; two pairs of orbitals, the parafrontals with three or four short hairs on the anterior half; ocellars and outer verticals strong. Cheeks moderately wide, the bare portion deeper than wide. Antennæ brownish red, the basal segments paler; third segment more than three times as long as wide; arista reddish on more than the basal half, brown apically, the penultimate segment not more than four times as long as wide.

Thorax cinereous pollinose, black in ground-colour, the humeri and scutellum yellowish. Hair and bristles black; four pairs of post-sutural dorso-centrals; three sterno-pleurals, the lower one about half as strong as the others.

Legs reddish yellow; tarsi blackish; apex of posterior femora broadly brown; posterior tibiæ brownish yellow.

Wings cinereous hyaline; first vein bristled above beyond the humeral cross-vein and on the apical section below; third vein bristled to opposite the posterior cross-vein, the fifth with three or four bristles basally. Posterior cross-vein situated more than its own length beyond the anterior cross-vein and almost three times its length before the bend of the fourth vein. Squamæ white; halteres yellow.

Abdomen reddish yellow, whitish pollinose, the apices of the segments broadly bare; with a median blackish vitta which is interrupted at the segmental incisures; apices of the third and fourth segments more or less clearly brownish. Second segment with a pair of median marginals, the third and fourth with a row.

Holotype, ♂, Gatooma, Southern Rhodesia, January 1928 (*A. Cuthbertson*), no. 2004 A.

Actia buccalis, sp. n.

First, third, and fifth veins bristled, anterior bristle on the middle tibiæ situated slightly beyond the middle; bare part of cheeks wider than deep.

Length 4 mm.

♂.—Head whitish pollinose, yellowish in ground-colour, the upper half of the occiput blackish, the parafrontals darkened on the upper half. Frontal vitta pale yellow; seven pairs of frontals, the alternate ones strong; two pairs of orbitals; ocellars and outer verticals strong. Cheeks rather narrow, the bare part wider than deep. Antennæ reddish yellow, the third segment darkened on somewhat more than the apical half; arista brown on apical third, the penultimate segment not twice as long as wide. Proboscis and palpi yellow.

Thorax cinereous pollinose, black in ground-colour, the humeri and scutellum yellowish. Four pairs of post-sutural dorso-centrals; three sterno-pleurals, the anterior and lower ones weak.

Legs reddish yellow; the tarsi brown; immediate apex of posterior femora brownish above.

Wings cinereous hyaline; first vein bristled on the upper surface beyond the humeral cross-vein and on the apical section of the lower surface; third vein bristled from the base to beyond the posterior cross-vein, the fifth with bristles almost to the cross-vein. Posterior cross-vein situated about one-and-a-half times its length beyond the anterior cross-vein and about two-and-a-half times its length before the bend of the fourth vein. Squamæ white; halteres yellow.

Abdomen black, the sides of the first, second, and base of the third segment very broadly yellow; with whitish pollen, which is thick on the bases of the second to fourth segments; second segment with a pair of marginals, the third and fourth each with a row.

Holotype, ♂, Gatooma, Southern Rhodesia, January 1928 (*A. Cuthbertson*), no. 2003.

DEXIOMERA, gen. nov.

Related to *Deximorpha* Rondani, differing in having the costal spine long and strong. Clypeal region narrowed for one-fourth the length of the face, the upper half of the face with a high sharp carina; antennæ one-third as long as face, the third segment two-thirds longer than the second; arista plumose. Six or seven pairs of frontals and scattered strong hairs on parafrontals; ocellars long and strong. Front of ♂ not half as wide as eye. Cheeks three-fourths as wide as eye-height.

Proboscis short; palpi short, about as long as third antennal segment. Acrostichals 1—2; doro-centrals 2—3; one sublateral; post-humeral absent; two intra-alar and supra-alars; sterno-pleurals 1—1; three pairs of marginal scutellars, no discals. Legs moderately long; pulvilli elongate. Anterior four tibiæ with antero-dorsal near the middle and two posterior bristles; hind tibiæ with two antero- and one postero-dorsal bristle; hair short. Wings with the apical cell short petiolate; bend of the fourth vein with short appendage; posterior cross-vein strongly curved, joining penultimate section of the fourth vein near apical fourth; third vein with two bristles basally; costal spine long and strong. Abdomen twice as long as wide, subcylindrical, tapering from near the base; second segment with a pair of dorsal and lateral marginals; third and fourth with a pair of discals and row of ten marginals. Genitalia small.

Genotype, *Dexiomera surda*, sp. n.

Dexiomera surda, sp. n.

Luteous, the thorax blackish, grey pollinose; wings broadly yellowish brown along the veins; anterior cross-vein broadly brown.

Length 8·5–11 mm.

♂.—Face and cheeks yellow; parafacials, front, and the occiput mostly brownish. Pollen greyish white, with ochreous tinge on the front above. Frontal vitta reddish brown, not as wide as parafrontal. Antennæ reddish yellow; arista brownish red, with black rays.

Thorax, from anterior view, with three broad obscure dark vittæ; anterior half, from posterior view, with a pair of narrow vittæ which broaden behind the suture and two very broad, interrupted, sublateral vittæ on anterior two-thirds, the disc rather cinereous brown, the pollen elsewhere greyish or greyish white. Scutellum pale. Hair black. Prosternum, propleura, and infrasquamal area bare.

Legs pale, the tarsi black.

Wings cinereous hyaline, appearing mostly brownish owing to the clouding of the veins. Squamæ whitish or pale yellowish. Halteres pale yellow.

Abdomen with a rather narrow median black vitta, each bristle arising from a black spot. Pollen fairly thick, greyish white, with more or less yellow tinge, on the median vitta and about the bristles with brownish cast, but this colour does not extend to the bases of the segments. Fifth sternite and genitalia brownish. Hair black, coarse. Abdomen deeper than broad.

Type, ♂, Algoa Bay, 19. ii. 1896; *paratypes*, 3 ♂, same data, and ♂, 22. x. 1896 (*Dr. Brauns*). Type in Hamburg Museum.

Zenillia uniseta, sp. n.

Black, the thorax and abdomen shining; palpi reddish. Length 6 mm.

♂.—Antennæ missing. Head whitish pollinose; frontal vitta brownish red, at the middle narrower than either parafrontal; eight pairs of frontals, the lower two below base of antennæ, the upper two strong and reclinate, no orbitals. Ocellars long; outer verticals absent; pile of occiput black. Front two-thirds as wide as eye; cheeks 1/7 as wide as eye-height.

Mesonotum very thinly cinereous pollinose, the pleura conspicuously so. Acrostichals 3—3; dorso-centrals 3—4; sterno-pleurals 2—1—1.

Legs black; pulvilli short; middle tibiæ with one antero-dorsal bristle; posterior tibiæ sparsely ciliate.

Wings cinereous hyaline; apical cell narrowly open; posterior cross-vein in middle of penultimate section of fourth vein. Third vein with a single strong basal seta. Squamæ white. Halteres reddish brown.

Third and fourth abdominal segment each with a narrow, white pollinose, medianly interrupted, basal fascia. Second segment with a pair of marginals, third with a row; fourth with a row of discals across the middle and with several submarginals and with bristle-like hair, the hair coarse and short dorsally, longer and more abundant on venter apically.

Type, ♂, Southern Rhodesia, 16. xi. 1912, reared from Lycænid larva.

Phorocera bolyodes, sp. n.

Black, shining, second antennal segment and a large spot on either side of the scutellum brownish red.

Length 6·5–7 mm.

♀.—Front three-fifths as wide as eye, moderately widening anteriorly; nine pairs of frontals, the lower three below base of antennæ, upper two reclinate; frontal hairs short, not abundant; ocellars long; two pairs of orbitals; outer verticals absent; occipital pile whitish; cheeks black-haired, one-fifth as wide as eye-height. Parafacials strongly narrowed below; facial ridges bristled on lower three-fifths, the vibrissæ very slightly above oral margin. Palpi brown. Third antennal segment narrow, a little more than twice as long as second; arista thickened on basal half. Head greyish white pollinose, the parafrontals almost bare above; face moderately retreating.

Mesonotum with obscure greyish-brown pollen, the humeri and pleura thinly grey pollinose. Acrostichals 3—4; sternopleurals 1—1—1 or 1—2; five pairs of marginal scutellars, the apical pair suberect and cruciate, one pair of discal scutellars; prosternum with two bristly hairs. The pale scutellar spots are usually joined over the apex of the scutellum and do not reach the base.

Legs black, the tibiæ somewhat brownish; pulvilli short; middle tibiæ with a single antero-dorsal bristle; posterior tibiæ sparsely ciliate.

Wings cinereous hyaline; bend of fourth vein without appendage; posterior cross-vein beyond middle of penultimate section of the fourth vein; third vein with three basal setæ. Squamæ white, with yellowish borders. Halteres reddish, with brown knob.

Abdomen from posterior view with the base of the second segment laterally and the whole of the third and fourth thinly cinereous pollinose. Second segment with a pair of marginals, third with a row, fourth with two rows of bristles on the apical half. One specimen has a pair of discals on the third segment.

♂.—Front half as wide as eye, without orbitals; first abdominal segment with a pair of weak marginals.

Type, ♀, Salisbury, Southern Rhodesia, 14. x. 1915; *allotype*, ♂, Salisbury, 1. x. 1915; *paratypes*, 2 ♀, Salisbury, 1. xi. 1915, 11. xi. 1915, and ♂, 13. ii. 1915. The specimens were reared from *Bolyodes hirtusalis* Walk. (Pyralidæ).

BESSERIA Desvoidy.

1.	Costa without spine or spinules	2.
	Costa with spinules. (Congo.)	*fossulata* Bezzi.
2.	Three lateral scutellars. (Cape.)	*caffra* Villeneuve.
	Two lateral scutellars. (Nigeria.)	*atypica*, sp. n.

Besseria atypica, sp. n.

Black, the abdomen, antennæ, palpi, face, cheeks, occiput below, and part of the legs yellowish red.

Length 5–5·5 mm.

♀.—Face, cheeks, and occiput whitish pollinose; parafrontals shining, frontal vitta brown, narrower than parafrontal; about six pairs of weak frontals, ocellars strong; verticals absent; cheeks and occiput white-haired. Antennæ somewhat brownish above.

Mesonotum shining black, the sides expanding to form a narrow presutural fascia, and the pleura whitish pollinose; pleura becoming reddish below. No presutural bristles; two notopleurals, one pair of dorsocentrals and acrostichals immediately in front of scutellum and one supra-alar; two pairs of marginal scutellars, sterno-pleurals 0—1.

Coxæ, trochanters, basal fifth of front, half of middle, and two-thirds of hind femora reddish, the legs elsewhere black.

Wings cinereous hyaline, with brownish tinge in front. Squamæ white. Halteres yellow.

Abdomen with short appressed black hairs.

Type, ♀, and three ♀ *paratypes*, Ibadan, Nigeria, February, March, and April, 1923.

XVII.—*On a Cestode Parasite of the Domestic Pigeon* (Columba livia). By Angus Foggie, B.Sc., Department of Zoology, University of Edinburgh.

Raillietina (*Skrjabinia*) *columbæ* (Fuhrmann, 1909) Fuhrmann, 1920.

A considerable number of specimens of this species was collected from the small intestine of pigeons in North Wales by Dr. R. F. Montgomerie. This species was also found by me in pigeons in Edinburgh, although no entire parasites were recovered. Accordingly this description is based primarily on the Welsh material.

The cestode is from 3 to 6 cm. in length and about 0·6 mm. in maximum width. The Edinburgh specimens were considerably longer than this, judging from portions of the strobila. The average number of segments is about 175.

The *scolex* is 0·18 mm. in diameter and bears a retractile rostellum, 50 μ in diameter, armed with a single row of hooks. The hooks, which are of the typical pickaxe shape of the Davaineidæ, are 7 μ along the head by 9 μ along the shaft. The armature of the rostellum consists of approximately ninety of these hooks.

The four typical tænioid suckers, about 50 μ in diameter, are armed round their margins with six or seven rows of straight or slightly incurving spines. Each row contains about sixty spines, from 3 μ to 8 μ in length. The spines of the inner rows are smaller than those of the outer.

A considerable length of *neck* intervenes between the scolex and the first clearly defined segment.

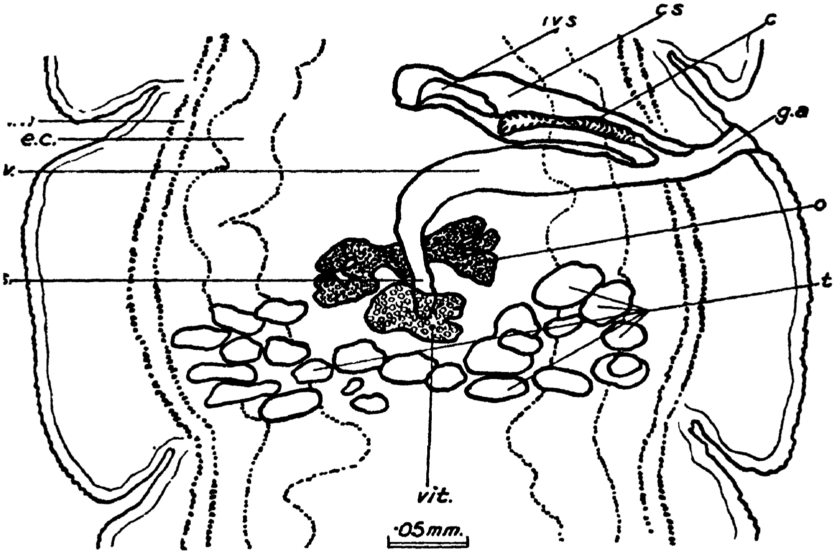
The lateral *nerve-cords* can be traced from the scolex into the gravid segments.

Only one pair of *excretory canals* was seen ; no trace of the dorsal pair could be found even in the neck region or in serial sections. The two canals run a slightly sinuous course, medial to the lateral nerves, from the scolex to the gravid segments. In a few segments a transverse vessel could be distinguished passing across the posterior margin of the segment and connecting the two longitudinal canals. The excretory vessel on the side of the genital pore passes ventral to the cirrus-sac and the vagina. The excretory canals are about 50 μ in diameter in mature segments.

The *musculature* is poorly developed. A thin layer of circular muscle fibres surrounds the genitalia, passing outside the lateral nerves. Outside this is a layer of longitudinal muscle bundles, round or oval in cross-section, with a diameter of 10 μ to 30 μ. In the neck region are two distinct layers of these bundles. The inner row does not completely encircle the segment, but is broken in the lateral field near the nerve-cord. The outer, however, which is composed of slightly smaller bundles, completely encircles the segment. These bundles are typically arranged in groups of three. In mature segments the two layers of longitudinal muscle bundles become merged into one, the bundles diminishing in size from within outwards. Outside the muscle bundles is a layer of parenchyma containing radiating fibres.

The *cuticle* is about 5 μ thick. It is non-cellular and is composed of an inner hyaline layer 3 μ thick, supporting a palisade of small projections 2 μ long.

A typical *mature segment* is about 0·25 mm. in length by 0·45 mm. in breadth. Mature segments from the Edinburgh pigeons were much more extended, and resembled more closely those described and figured by Fuhrmann, being longer than broad. The posterior edge of the segment is longer than the anterior, giving the worm a serrated outline in the region of the mature segments.



Mature segment drawn from a whole mount.

c., cirrus; *c.s.*, cirrus-sac; *e.c.*, longitudinal excretory canal; *g.a.*, genital atrium; *i.v.s.*, internal vesicula seminales; *l.n.*, longitudinal nerve-cord; *o.*, ovary; *r.s.*, receptaculum seminis; *t.*, testes; *v.*, vagina; *vit.*, vitellarium.

The *genital pores* are irregularly alternating.

The *testes*, about twenty-seven in number, are round or oval, and about 40 μ in diameter. They occupy the posterior third of the segment and extend laterally over the ventral excretory vessels to the region of the longitudinal nerve-cord.

The *cirrus-sac*, about 0·18 mm. long by 35 μ broad, lies in the anterior third of the segment, passing diagonally forward from the genital atrium to the middle line.

The protrusible *cirrus* is armed with numerous backwardly directed spines. When extruded it is approximately 55 μ long by 40 μ broad. There is a weak cirrus retractor muscle. In some specimens a blue pigment was present in the cirrus-sac.

The *vasa efferentia* from the testes run dorsal to the ovary and the vagina, just within the dorsal layer of circular muscles, to the *external vesicula seminalis* in the middle of the segment, which is continuous with the *internal vesicula seminalis* and the lumen of the cirrus.

The wide *vagina* leaves the genital atrium posterior to the opening of the cirrus-sac and curves in a posteromedial direction to the middle line, where it narrows, and then widens to form the spindle-shaped *receptaculum seminis*. The vagina is 0·22 mm. long and the receptaculum 30 μ long by 10 μ wide.

The *ovary*, which lies in the middle line just behind the centre of the segment, consists of two lobate portions, with a diameter of about 45 μ, connected by a narrow isthmus of ovarian tissue, which passes ventral to the vagina and anterior to the receptaculum.

The *vitellarium* lies posterior to the ovary and dorsal to the receptaculum. It is round, oval, or slightly lobate, with a diameter of about 50 μ.

The *uterus* appears to be absent or to disintegrate at an early stage, and the eggs are found, each in a capsule, in the loose parenchyma.

The *gravid segments* have a barrel-shaped outline and in the Welsh material attained the length of 1 mm. and the breadth of 0·5 mm. The organs of the mature segment exhibit progressive degeneration, and the last few segments show only the lateral nerve-cords and the excretory canals, in addition to the mass of egg-capsules.

The segment contains about 150 *egg-capsules*, each with one developing egg. In the hindmost segments these are in the onchosphere stage, surrounded by an egg-membrane.

The *onchosphere* is oval, 30 μ long by 25 μ broad, and is armed with three pairs of hooks situated towards one pole. The hooks are 10 μ long and consist of a sickle-shaped blade set on a straight shaft.

DISCUSSION.

The material examined differs in a number of points from that described by Fuhrmann in 1909. He gives 6–7 cm. as the length of the worm, whereas the majority of my specimens were about 4 cm. long. He records 120 rostellar hooks, 11 μ long, as opposed to 90 hooks, 9 μ long.

The material from Edinburgh approaches the dimensions given by Fuhrmann more closely than the Welsh material. Mature segments of the Edinburgh material were approximately twice as long as they were broad, while those of the Welsh material were broader than long. A gravid segment of the Edinburgh material was 2 mm. long by 1 mm. broad, whereas the largest gravid segment of the Welsh material was 1 mm. long by 0·5 mm. broad. Part of this difference may be due to the state of contraction of the segments of the Welsh material. The rostellar hooks of the Edinburgh and Welsh specimens were similar in size and number.

The differences between the two lots of material studied and that described by Fuhrmann seemed to be too slight to be of specific value, and accordingly the British species is regarded as identical with Fuhrmann's.

ACKNOWLEDGMENTS.

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XVIII.—*On* Nymphopsis acinacispinatus, *a new Pycnogonid from Queensland.* By G. WILLIAMS, M.Sc., Department of Zoology, Queen's University of Belfast.

THE Pycnogonid described in this paper was collected by Mr. Melbourne Ward, of Sydney, at Port Curtis, on the Queensland coast. Later the specimen was entrusted to me for examination by Professor T. Thomson Flynn, to whom my thanks are due not only for the opportunity of studying this new species, but also for much helpful criticism and for the use of his extensive literature on the group.

Nymphopsis acinacispinatus, sp. n.

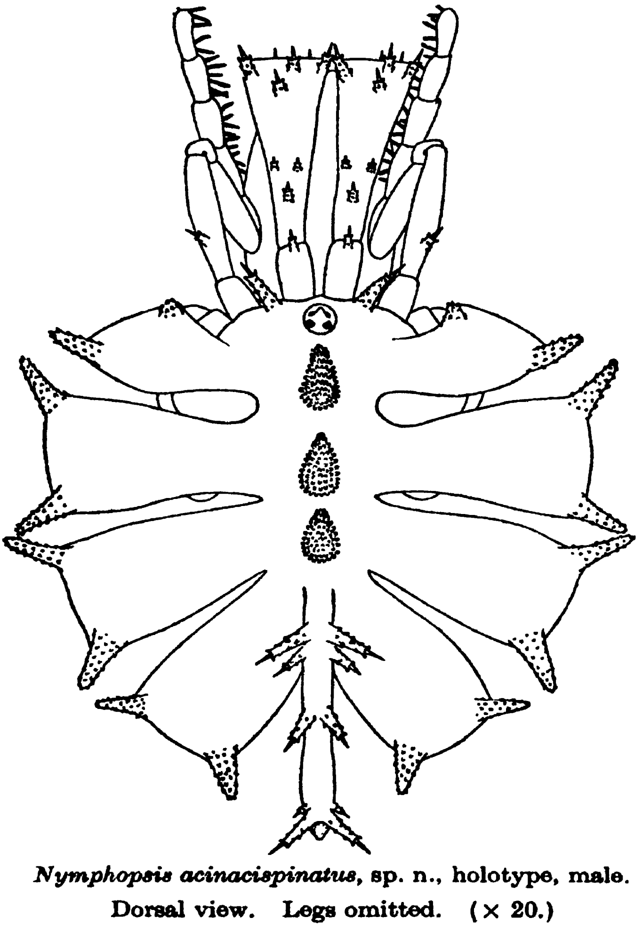
Occurrence.—Port Curtis, Queensland, 5–8 fathoms, amongst broken shell. One specimen, male.

Description.—*Trunk.* Unsegmented, somewhat shorter than proboscis. Three prominent dorsal processes between ocular tubercle and base of abdomen, anterior one situated just behind cephalic segment. Distal part of each process bends anteriorly; curvature most marked in anterior process. Each consists of a cylindrical pillar beset by short, stumpy, blunt spines, the latter being more densely grouped at upper end (fig. 2).

Lateral processes narrow proximally but much thickened distally. Length of second lateral process twice width of trunk at same level. The space between lateral processes becomes progressively less posteriorly. Situated on distal dorso-lateral borders of each lateral process is a pair of cylindrical spinous processes which resemble those of trunk in general form, the largest, however, measuring but little more than half the length of dorsal ones (fig. 1).

Cephalic segment three-eighths total length of trunk, bearing two small compound spines which slope forwards and outwards from their insertion on dorsal antero-lateral margin of cephalon. Ocular tubercle fairly stout, distal part narrowing somewhat abruptly to end in a well-marked pointed apex. Four approximately equal oval eyes on upper part of cylindrical portion. Proboscis longer and wider than trunk, directed obliquely downwards and forwards; narrowly ovate, with greatest width a little beyond the middle, its terminal extremity truncated. Abdomen slightly shorter than trunk, placed somewhat horizontally, but with distal end curved ventrally, proximal two-thirds slender and cylindrical, distal third slightly swollen opposite place of attachment of posterior pair of dorsal spines, narrowing from this point to the bluntly conical tip. Four pairs of large prominent compound spines borne dorsally. A pair of short spines occurs just in front of the base of fourth pair, sloping outwardly and posteriorly (fig. 2).

Fig. 1.

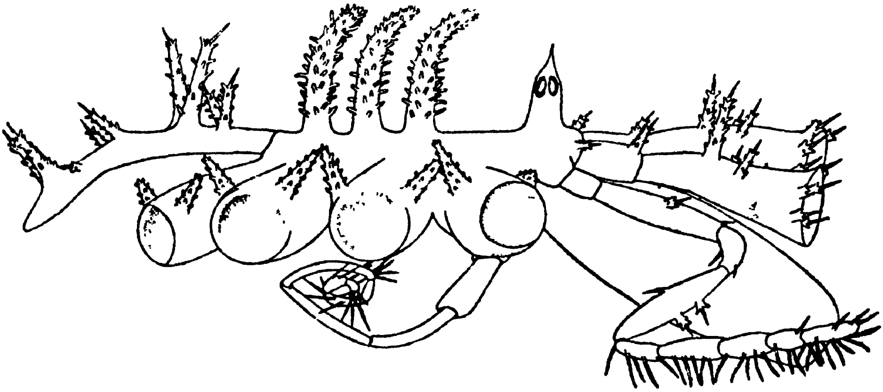


Nymphopsis acinacispinatus, sp. n., holotype, male. Dorsal view. Legs omitted. (× 20.)

Chelophores. Scape two-jointed; distal joint three times length of proximal joint with extremity markedly trumpet-shaped (fig. 2). Chela globular, borne inside trumpet-shaped extremity of scape; a slight division of anterior margin of chela is indicative of the vestigial pincers. Small median compound spine on distal extremity of proximal joint. Distal joint bears a much larger single compound spine and a pair of spines, one on each side, a little in front of median one (figs. 1 & 2). Many compound spines occur round expanded extremity of joint.

Palps. Much longer than proboscis; nine-jointed, second joint longest, fourth joint long but shorter than second, first and third short and subequal, seventh and eighth also short eighth being slightly smaller than seventh; sixth and ninth longer than any of the other short joints and roughly half the length of fourth joint. Short, thick, simple spines and some compound ones occur on second, third, and fourth joints, whilst a number of long hair-like processes arise from ventral surfaces of remaining distal joints (fig. 2).

Fig. 2.

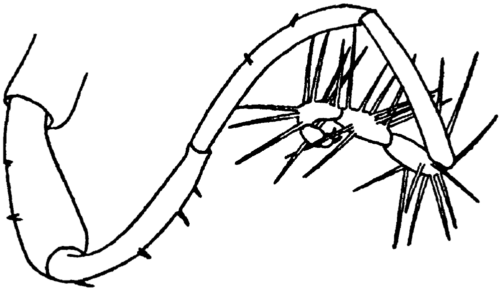


Nymphopsis acinacispinatus, sp. n., holotype, male. From the right side. Legs omitted. (× 20.)

Ovigers. Ten-jointed; first joint short and thick, second more than twice length of first joint; third joint curved and subequal to second; fourth longer than third; fifth subequal to second and third; sixth, seventh, and eighth subequal and about one-third length of third joint; ninth about half as long as eighth; tenth very small, less than half the size of ninth. Scattered simple spines occur on second to fifth joints, whilst very long hair-like processes are found on remaining distal joints. First and second more than twice as thick as remaining joints (fig. 3).

Legs. Short and heavily armed with strong compound spines. First coxa with many strong compound spines. Second coxa one-and-a-half times length of first coxa, bearing three paired compound spines and a few simple ones (figs. 4 & 5). Male genital aperture borne on extremity of long ventral distal offshoot. This structure appears to be equally developed on last three legs, but that on the first leg is definitely small and rudimentary, there being no genital aperture present. Many unbranched hair-like processes arise from various parts of tubular outgrowth. Third coxa subequal to first. Femur and tibiæ subequal; former bears proximally and ventrally two pairs of compound spines, distally and dorsally a pair of outwardly directed strong compound spines, with an even longer and thicker spine projecting from space between them. Opening of cement-gland occurs on extremity of small tubular dorsal outgrowth situated below insertion of large median spine mentioned above. First tibia bears proximally two closely apposed rows of tall vertical branched processes each of which is terminated by a long sharply pointed spine, distally a pair of short compound spines.

Fig. 3.



Nymphopsis acinacispinatus, sp. n., holotype, male.
Oviger of right side. (× 26.)

Second tibia bears four pairs of dorsal compound spines similar to those of first tibia, together with three pairs of distally placed short compound spines. Tarsus small, with a few ventrally placed simple spines. Propodus two-thirds length of second tibia and markedly curved, bearing four rows of simple spines—one dorsal, one ventral,

Fig. 4.

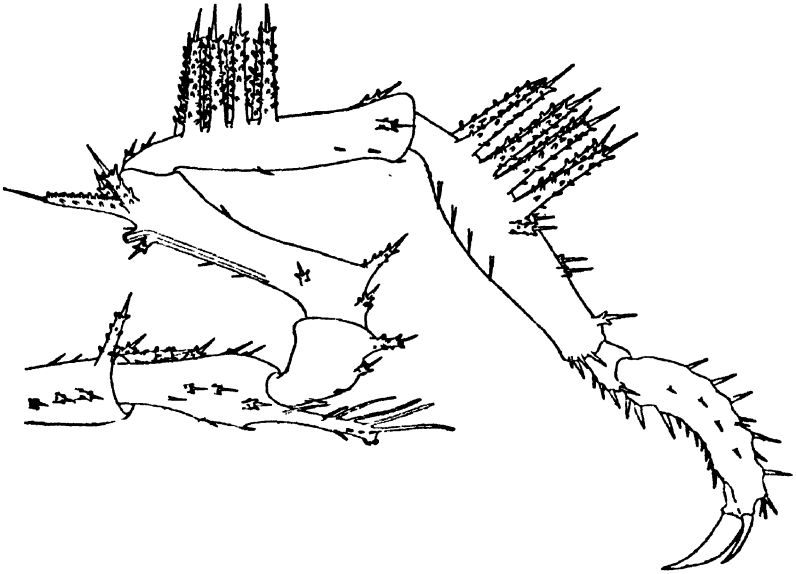
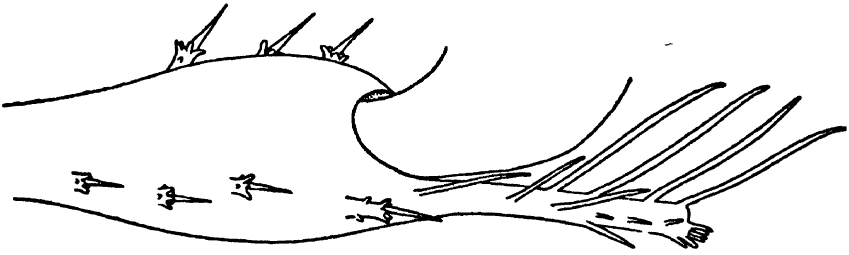


Fig. 5.



Nymphopsis acinacispinatus, sp. n., holotype, male.

Fig. 4.—Third leg of right side. (× 26.)
Fig. 5.—Second coxa of third right leg, showing genital process. (× 53.)

and two lateral. Main claw curved and powerful, half as long as propodus. Auxiliary claws about half the length of main claw.

Armature. As is the case in other species of *Nymphopsis* the characteristic armature of the trunk and appendages is a series of compound spines. A typical spine exhibits a lower thickened portion beset by short blunt processes and a distal portion in the form of a sharply pointed movable spine. The occurrence of such structures on certain parts of the body in the present species indicates that the curved dorsal processes of the trunk are, in all probability, to be regarded as having been derived from the typical spine-bearing outgrowths so characteristic of other *Nymphopsis* species.

Measurements in mm. (*holotype, male*).

Proboscis, length	1·9
Trunk :	
Length	1·7
Breadth across second lateral processes	3·08
Breadth between first and second lateral processes	0·675
Abdomen : length	1·55
Cephalic segment : length	0·75
Chelophores : length	1·41
Diameter of trumpet-shaped extremity of chelophore	0·5
Third right leg :	
First coxa	0·625
Second coxa	0·75
Third coxa	0·56
Femur	1·63
First tibia	1·68
Second tibia	1·67
Tarsus	0·31
Propodus	1·1
Main claw	0·56
Auxiliary claw	0·29

The holotype, male, has been deposited in the collection of the British Museum (Natural History).

Remarks.—The genus *Nymphopsis* at present contains six species; these present an interesting geographical distribution, since they have been found in such widely separated regions as Australia (*N. armatus* Haswell), East Indian Archipelago (*N. korotnewi* Schimkewitsch), Japan (*N. muscosus* Loman, 1908), Cape of Good Hope (*N. abstrusus* Loman, 1923), and Venezuela (*N. anarthrus* Loman, 1928). The present specimen comes from the same region as Haswell's genotype. Although it closely resembles the other species, its nearest relative would seem to be *N. abstrusus* from the African coast. It may be distinguished from that species by the greater length of the lateral processes in comparison with the width of the trunk, by the relatively greater development of the three dorsal trunk outgrowths, which lack a terminal spine, and by various minor differences, such as the number and arrangement of the compound spines and the presence of a well-developed genital process on the second coxa of each of the last three legs.

Loman, in his key to the genus *Nymphopsis* (1928), comes to the conclusion that *N. korotnewi* is synonymous with *N. armatus.* The scape of the chelophore, however, is two-jointed in *N. korotnewi*, whilst it is made up of but a single joint in *N. armatus* (Flynn, 1929). Furthermore, Flynn's re-examination of Haswell's species reveals the fact that the trunk bears two small dorsal elevations, so that *N. korotnewi* alone is peculiar in lacking any such outgrowth. From a consideration of the above differences it would appear that it is not possible to regard *N. korotnewi* as a synonym of *N. armatus.*

Below I give a modification of Loman's key to the genus *Nymphopsis*, in order to make it include the new species and also to correct the definition of *N. armatus.*

Key to the Genus Nymphopsis.

1.	Scape of chelophore one-jointed	2.
	Scape of chelophore two-jointed	3.
2.	Dorsal trunk-processes two, very small	*armatus.*
	Dorsal trunk-processes two, very tall	*anarthrus.*
3.	Dorsal trunk-processes absent	*korotnewi.*
	Dorsal trunk-processes tall and well developed	4.
4.	Dorsal trunk-processes two, tall; claw little shorter than propodus	*muscosus.*
	Dorsal trunk-processes three, tall; claw only half as long as propodus	5.
5.	Dorsal trunk-processes vertical, with long terminal spine, a little taller than ocular tubercle; second lateral process equal in length to width of trunk	*abstrusus.*
	Dorsal trunk-processes curved anteriorly, devoid of terminal spine, much taller than ocular tubercle; second lateral process about twice the width of trunk	*acinacispinatus.*

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XIX.—*A new Family of Hemiptera-Heteroptera with Notes on the Phylogeny of the Suborder.* By W. E. CHINA, M.A.

THE genus *Leotichius* was established by Distant[*] in 1904 to hold a new species *L. glaucopis*, which he described from a single male taken at Rangoon, Burma. The new genus was referred to the family Leptopodidæ, which was then regarded by Distant as a subfamily of the Saldidæ (Acanthiidæ Reut.). Unfortunately the description of this remarkable Heteropteron was passed over almost unnoticed owing to an amusing sequence of events which is worth recalling.

On the preceding page of the same work, Distant had separated the Saldinæ from the Leptopinæ by the number of ocelli, two in the former and three in the latter (including *Leotichius*). At the same time he described a new genus and species from Ceylon, *Valleriola greeni*, which he placed in the Saldinæ because of the presence of only two ocelli. It is, of course, now well known that there are in the Heteroptera always either two ocelli or none at all, but at the time of Distant's paper Fieber's[†] erroneous statement to the effect that the Leptopodæ (*sic*) possessed three ocelli had not been disputed, although Dufour[‡] had long since shown that they possessed only two. In 1906 Bergroth[§] pointed out that *Valleriola* belonged to the Leptopinæ and not to the Saldinæ and that Distant's genus was synonymous with *Leptopus* Latr., and his species with *L. assuanensis* Costa. As Bergroth made no correction of Distant's statement as to the number of ocelli, Distant concluded that the transference of *Valleriola* to the Leptopinæ inferred the presence of three ocelli in that genus. He therefore re-examined the specimen with the help of Messrs. Austen and Waterhouse, and promptly published * a note to the effect that if Bergroth and Reuter (who had also entered the discussion) had correctly synonymized *V. greeni* Dist. with *L. assuanensis* Costa, then they must have placed the species in the wrong genus and the wrong family, since there were actually only two ocelli. The relations between Distant and his fellow Hemipterists on the Continent had for some years been somewhat strained, and the scientific quarrel now developed into personal recriminations. Reuter † published in the following year a paper on the genus *Valleriola* Dist. Having examined all the species of the Leptopinæ available, including the genotype of *Leptopus*, Reuter found that all these species possessed only two ocelli. This result was also arrived at independently by his colleagues Messrs. Poppius and Nordström. Having come to this conclusion he was able to trace the original error to Fieber, but rather than justify Distant's mistake he emphasized all the other characters by which Fieber had separated the two families and went on to point out the unreliability of absence of ocelli as a family character. In this paper, p. 214, Reuter actually mentioned the new genus *Leotichius* in connection with the discussion on ocelli and sarcastically wrote that it would be interesting to know whether Messrs. Austen and Waterhouse could see three ocelli in that genus. Distant replied to this attack in a later number of the same journal ‡, but added nothing to the argument except that he had apparently followed Saunders in his Hemiptera Heteroptera of the British Isles and not Fieber. This reply stimulated Reuter § to publish still further on the discussion. His paper which was entitled "Die hemipterologischen Arbeiten W. L. Distants und Speziell die Valleriola-Frage," consisted mainly of a personal attack on Distant.

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[*] Fauna Brit. Ind., Rhyn. ii. p. 406 (1904).
[†] 'Die Europaischen Hemiptera, p. 25 (Wien, 1861).
[‡] Ann. Science Nat. Paris (4) x. pl. 22, fig. 7 (1833).
[§] Wiener Ent. Zeit. xxv. p. 8 (1906).

Carried away by this personal conflict with Distant, Reuter overlooked two important facts. Firstly, that

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* Ann. & Mag. Nat. Hist. (7) xviii. p. 293 (1906).

† Wiener Ent. Zeit. xxvi. p. 211 (1907).

‡ *Loc. cit.* p. 327.

§ *Loc. cit.* xxvii. p. 85 (1908).

Valleriola Dist., actually was generically distinct from *Leptopus* Latr., and his species *V. greeni* specifically distinct from *L. assuanensis* Costa, and, secondly, that *Leotichius*, even if it possessed only two ocelli, could not possibly belong to the Leptopodidæ.

In 1911 Horvath *, in an excellent revision of the Leptopodidæ satisfactorily demonstrated the generic and specific validity of Distant's *Valleriola greeni*, but because Distant refused to lend him the unique type-specimen he was unable to ascertain the exact systematic position of *Leotichius*, although he doubted its assignment to the Leptopodidæ.

Some years ago my friend Prof. T. Esaki drew my attention to the anomalous position of *Leotichius*, but until recently I have been unable to devote the time to it. An examination of the unique specimen reveals the fact that the resemblance to the Leptopodidæ is purely superficial, and rests entirely on the shape of the head with the subpedunculate ocelli and on the areolate corium. The genus is herewith redescribed.

LEOTICHIUS Dist.

Head exserted (*i. e.*, with distinct neck), the vertex horizontal, the frons and clypeus vertical; eyes subpedunculate, laterally very prominent, almost their entire functional surface ventral, only a narrow margin dorsal; ocelli almost contiguous at top of an elevated tubercle in middle of vertex between the eyes; antennæ short, inserted at apex of frons on each side of base of clypeus; the first two segments short and incrassate, tuberculate, with each tubercle giving rise to a short scale-like bristle; third and fourth segments sublinear, the fourth very slightly flattened and dilated; two basal segments subequal, third twice as long as second, the fourth slightly longer than second; clypeus feebly prominent; labrum moderately large, entirely covering first rostral segment and extending over base of second segment; rostrum three-segmented by Reuter's standard, although actually four-segmented; first and second segments very short, third longest, fourth slightly less than half the length of third; straight, not curved, extending to base of front coxæ, entirely devoid of spines or bristles. Pronotum with distinct anterior collar, calli with four conical tubercles, the inner pair smaller

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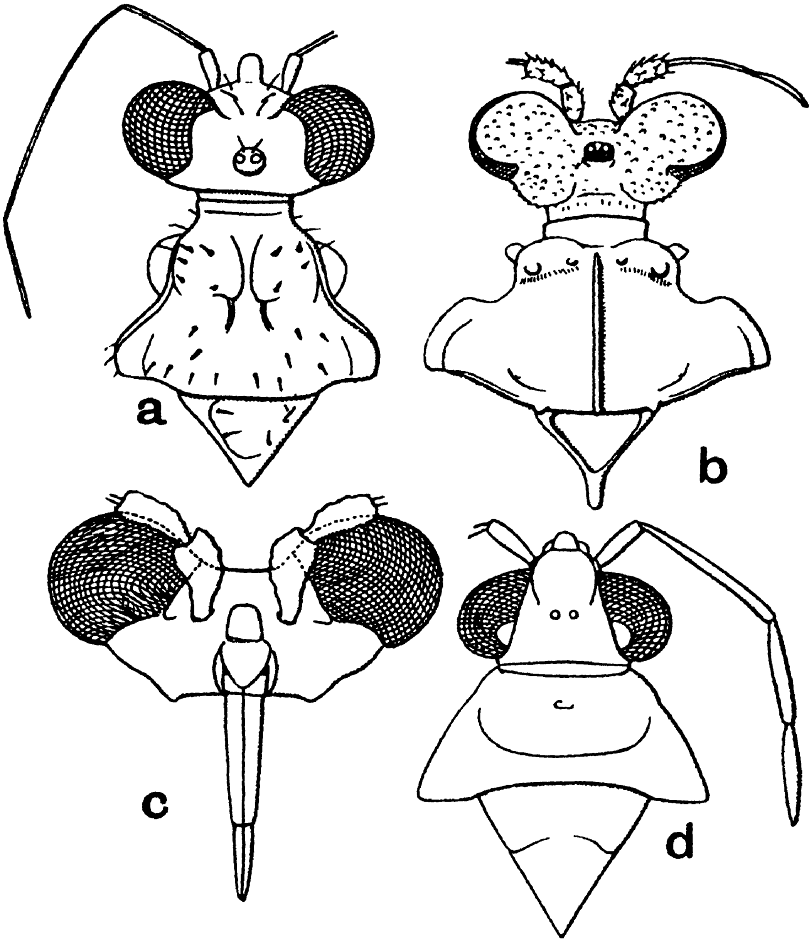
* Ann. Mus. Nat. Hungarici. ix. p. 358 (1911).

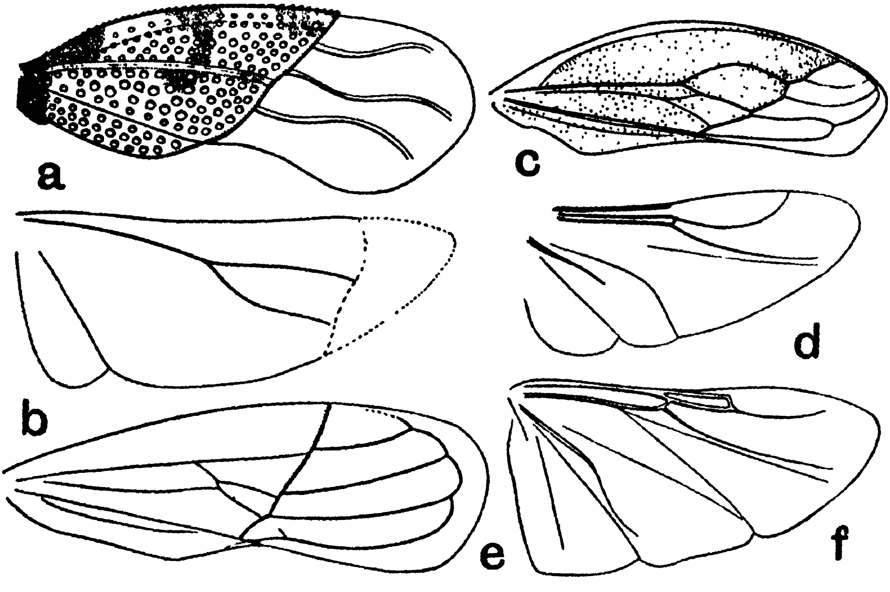
Fig. 1.



a. *Leptopus marmoratus* Goeze. b. *Leotichius glaucopis* Dist. c. *Leotichius glaucopis* Dist., under side of head showing ventral eyes. d. *Acanthia pallipes* F.

than the outer; the lateral margin of anterior lobe on each side with a short tongue-shaped, outwardly directed, laminate process; posterior lobe with a strongly raised median percurrent carina, lateral margins arcuately subdilated, humeral angles subacute; posterior margin convex, with a small tubercle on each side of median carina; surface of posterior lobe deeply and regularly punctate. Scutellum with strongly raised marginal carinæ ending at apex in a strongly, laterally compressed lobe or process. Hemielytra with clavus and corium regularly areolate; corium with only a single median sector, strongly raised

Fig. 2.



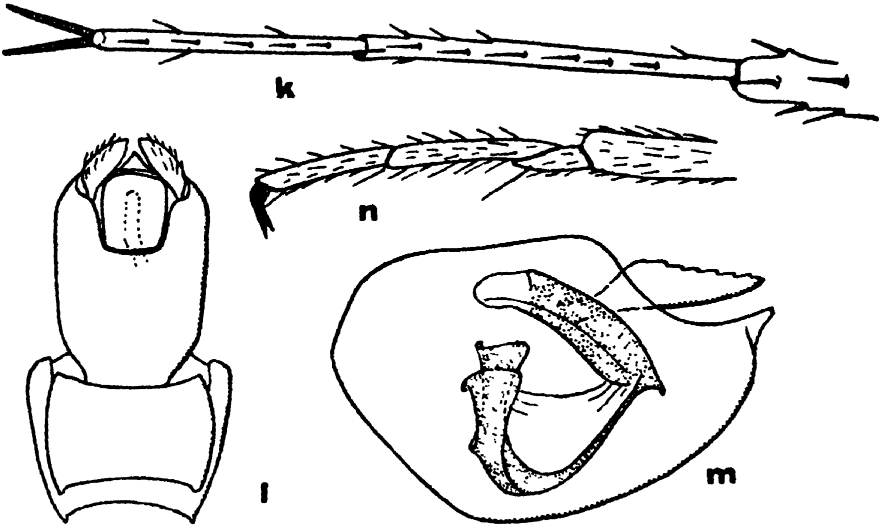
a. *Leotichius glaucopis* Dist., hemielytron. *b.* Wing. c. *Leptopus marmoratus* Goeze, hemielytron. *d.* Wing. e. *Acanthia pallipes* F., hemielytron. *f.* Wing.

and carinate, a second outer sector seen obscurely in transmitted light; costal margin minutely serrate; membrane with three sinuate longitudinal veins very feebly defined. Hind wing with a single nervure branching into two at middle of wing.

Mesosternum with median suture. Metasternum entire with a median longitudinal carina posteriorly ending between posterior coxæ in a laterally compressed elevated process; metasternal scent-gland orifices apparently absent; acetabular sclerites deeply and regularly punctate.

Legs relatively short, the hind tibiæ moderately long and characteristically sinuate; armed more or less regularly with a double row of moderately long bristles, not spinous; front tarsi one segmented, middle and hind tarsi two-segmented, each armed with a pair of long, straight, equal claws without arolia. Abdominal spiracles ventral. Male genital segment (ix) somewhat elongate, parameres symmetrical, densely pilose; structure of ædeagus difficult to make out owing to minute size.

Fig. 3.



Leotichius glaucopis Dist. *k*. Hind tarsus. *l*. Dorsal view of male genital segments. *m*. Lateral view of ninth segment with male genitalia and one paramere shown in situ. *Leptopus marmoratus* Goeze. *n*. Hind tarsus.

Basal plates with a median process extending ventrally along membranous proximal portion of phallosoma to chitinized distal portion. Conjunctiva moderately well developed, vesica apparently obsolete or membranous.

It is quite clear from the above description that *Leotichius* cannot remain either in the Leptopodidæ or in the Acanthiidæ (Saldidæ), I therefore propose to establish a new family **Leotichidæ**, to be distinguished from other families of Acanthioideæ as shown in the following table:—

	LEPTOPODIDÆ Costa.	ACANTHIIDÆ Leach.	LEOTICHIDÆ, fam. nov.
Head	Exserted, posterior margin of eyes not reaching anterior margin of pronotum.	Inserted, posterior margin of eyes reaching anterior margin of pronotum.	As in Leptopodidæ.
Eyes	Subpedunculate, dorsal area subequal to ventral area.	Not subpedunculate, dorsal area subequal to ventral area.	Subpedunculate, functional area almost entirely ventral.
Ocelli	Placed at top of prominently elevated tubercle on vertex.	Ocelli not placed at end of raised tubercle.	Ocelli as in Leptopodidæ.
Clypeus	Prominent, seen from above.	Feebly prominent, genæ very distinct.	Clypeus invisible from above.
Rostrum	Short, strongly recurved, not extending beyond prosternum; formula * (1) : 4 : 3 : 2, second and third segments spined or bristled.	Long, strongly curved outwardly at base only; not spined or bristled; extending to or beyond mesosternum; formula (1) : 2 : 4 : 3, third segment very long.	Short, straight, but widely speared from sternum, without spines or bristles, extending only to anterior coxæ; formula (1) : 2 : 4 : 3.
Antennæ	Longer than head and pronotum together, very slender, the basal segment slightly thickened, the second much longer than first (except in *Patapius* Horvath) in which two basal segments are thickened and subequal.	Longer than head and pronotum together, moderately robust, the basal segment slightly thickened, the second much longer than the first.	Shorter than head and pronotum together. Two basal segments strongly incrassate and tuberculate, the second subequal to first.
Pronotum	Posterior margin convex, posterior surface strongly punctate, no median carina.	Posterior margin broadly concave, posterior surface not punctate, no median carina.	Posterior margin convex, posterior surface densely punctate, a strong median carina.

		ace	Short, more or less equilateral, with strongly laterally compressed apical process.
	Cov by	Not cove by pronotu , forming a v characterist broad area a se of scutellum.	Covered by pronotum.
		h two apical cells, br e with four apical or ore.	Corium with a single median longitudinal vein; membrane with three sinuate longitudinal veins.
Wi	With gi elongate to two	Basal cell much broader, an additional cell cut off at its apex by a transverse vein (hamus).	No basal cell, a single vein forked in middle of wing.
	Pagiopodous, femora attenuated towards extremity, anterior femora and tibiæ armed with strong spines, middle and hind tibiæ without bristles.	Pagiopodous, femora not attenuated apically, anterior femora and tibiæ not spined, middle and hind tibiæ armed irregularly with short stout bristles.	Sub-pagiopodous, femora narrowed at extreme apex, anterior femora and tibiæ armed with moderately stout bristles; middle and hind tibiæ armed with rows of bristles.
	All tarsi three-segmented.	All tarsi three-segmented.	Front tarsi one-segmented, middle and hind tarsi two-segmented.
	Basal plates with median prolongation along underside of phallosoma; vesica complex at base.	Basal plates without median prolongation; vesica simple, in close contact with ejaculatory duct inside.	plates with median pro- lc ation along underside of p losoma; vesica apparently ıbranous continuation of unctiva.
in	in in		

The question now arises as to the correct systematic position of the family Leotichidæ. It is impossible to run it down in Reuter's rather poor key * to the Heteropterous families without considerable contradictions.

The absence of arolia and the segmentation of the rostrum (so-called three-segmented) distinguish it from the Hebridæ, Pyrrhocoridæ, Tingididæ, Piesmidæ, Lygæidæ (Myodochidæ), Neididæ, Coreidæ, and Pentatomidæ. The relatively long free antennæ differentiate it from the Gelastocoridæ (Nerthridæ), Peloridiidæ, Belostomatidæ Nepidæ, Naucoridæ, Notonectidæ, and Corixidæ, but not from the Ochteridæ, since the antennæ in that family are very little shorter than those of *Leotichius*.

The absence of a cuneus in the hemielytron, the non-composite metasternum, and the subpagiopodous coxæ, exclude *Leotichius* from the Miridæ, Termatophylidæ, Microphysidæ, Isometopidæ, Anthocoridæ, and Cimicidæ. The apical claws exclude it from the Gerridæ and Veliidæ, the absence of a prosternal stridulatory sulcus from the Reduviidæ and Macrocephalidæ (Phymatidæ), and the presence of ocelli from the Hydrometridæ, Æpophilidæ, and Aradidæ.

The rostrum of the *Leotichius*, although straight, is not porrect †, and this, together with the three instead of four free veins in the membrane would exclude the genus from the Joppeicidæ ‡ according to Reuter's key, although the structure of the head itself and the tarsal segmentation gives a much more reliable distinction. Reuter's separation of the Nabidæ is also very weak, both the characters given being variable. However, the short apparently three-segmented rostrum excludes *Leotichius* from this family. The structure of the head, non-constricted at the base and beyond the eyes, distinguishes it from the Henicocephalidæ, while the entirely coriaceous corium and clavus exclude it from the Mesoveliidæ. This brings us to the Acanthioideæ. The short second rostral segment (first of Reuter) precludes association with the Leptopodidæ, and the strongly reflexed head with the Velocipedidæ, leaving only the Acanthiidæ from which *Leotichius* differs by the venation of the membrane.

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* Act. Soc. Sci. Fenn. xxxvii. no. 3, p. 79 (1910).

† In the three specimens of *Joppeicus paradoxus* Put. in the British Museum collection the rostrum is not porrect, but carried beneath the head in a normal manner. I cannot understand Reuter's statement.

‡ I am inclined to agree with Bergroth that this family is more closely related to the Lygæidæ, particularly to the *Clerada* group than to the Aradidæ.

Just before his death Reuter published a short paper * in which his previous conclusions were considerably modified, and a fresh family key was put forward. This key serves our purpose no better than the last. The first problem encountered is with regard to the length of the antennæ, which decides whether the group should be associated with the Ochteroid and Notonectoid families or not. Although in *Leotichius* they are moderately long and free, they are, as we have already seen, very little longer than those of *Ochterus*. As the mesosternum (though not the metasternum) is composite, the metasternal orifices are absent and the eyes present, we can decide on section 5 and not on section 18. We are at once in difficulties over the segmentation of the rostrum (3 instead of 4), but ignoring this we reach the Ochteridæ. If we go to section 18, on the length of the antennæ, we eventually reach 25. Although the mesosternum is composite, the absence of a cuneus in the hemielytron, eliminates all the Cimicoid families, and we are forced to go on to 36 in spite of the structure of the mesosternum. Thence we reach 40, and the Acanthioid families again.

If Reuter's keys are ignored, one is struck by the resemblance *Leotichius* bears to certain Lygæidæ, especially in the structure of the hemielytra. The almost pedunculate eyes remind one of the head in *Germalus*, *Ninyas*, and other Geocorinids. In the genus *Malcus* the ocelli are contiguous as they are in *Leotichius*, while in *Chauliops* the antennæ are very short. These resemblances, however, would appear to be entirely fortuitous, and in spite of the very aberrant rostral, venational, tarsal, and other characters, it is perhaps best, at least for the present, to associate the new family with the Acanthioideæ.

But what of the Ochteridæ ? We have seen that the antennæ in this family are very little shorter than those of *Leotichius*. The Ochterid rostrum too, although quadriarticulate according to Reuter, has almost the same rostral formula as in *Leotichius*, viz., 2 : 1 : 4 : 3 (the first two segments being short), although the first is longer than the second, very broad, and not hidden by the labrum. It is true that the metasternum in *Leotichius* is not composite as in the Ochteridæ, but it has been shown by McAtee and Malloch * that the composite or non-composite structure of the meso- and metasterna is not of family significance, and varies with the degree of wing-development. The fact is that the Ochteridæ are much more closely allied to the Acanthioidæ than Reuter would have had us believe. The whole structure of the head and pronotum is remarkably like that in the Acanthiidæ. However, even if the Ochteridæ be referred to the Acanthioideæ, *Leotichius* remains just as distinct from that family as from the Acanthiidæ and Leptopodidæ, differing particularly in the venation of the membrane and the tarsal structure.

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* Öfv. Finska Vet.-Soc. Förh. liv. no. 6 (1912).

It is now twenty-one years since the publication of Reuter's last work on the Phylogeny of the Heteropterous Families, and a revision of his classification in the light of recent knowledge is overdue. It is, therefore, not out of place here to draw attention to a few changes. The family Peloridiidæ have now been shown † to have no relationship with the Ochteridæ. Even if Hemipterists refuse to accept their transfer to the new series of Homoptera, Coleorrhyncha, they can no longer be associated with the Ochteridæ. Indeed they have quite recently ‡ been shown to be arboreal in habit. If, therefore, as has just been suggested, the Ochteridæ are removed to the Acanthioideæ, Reuter's superfamily Ochteroideæ ceases to exist.

The Gelastocoridæ are undoubtedly related to the Ochteridæ—in fact, all the littoral families must have had a common origin. A biological sequence showing a gradual change from littoral life to a truly aquatic existence can be traced in which these families form the connecting links. Originating in the rapidly running and flying littoral Acanthiidæ and Ochteridæ in which already a reduction in the length of the antennæ has taken place, it passes through the distinctly more sluggish Gelastocoridæ with their habit of burrowing in the mud, their reduced antennæ, raptorial fore legs, and short rostrum, to the still more sluggish subaquatic Nepidæ without

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* Proc. Biol. Soc. Washington, xxxviii, pp. 145–146 (1925).

† Myers & China, Ann. & Mag. Nat. Hist. (10) iii. pp. 282–294 (1929).

‡ China, Ann. & Mag. Nat. Hist. (10) x. pp. 392–395 (1932).

ocelli, and with respiratory siphons indicating incomplete dissociation from the terrestrial life. From the Nepidæ the series may be traced through the more perfectly adapted Belostomatidæ with swimming hind legs and respiratory siphon practically obsolete, but with raptorial fore legs still well developed, to the Naucoridæ. The final step is to the totally aquatic Aphelochiridæ, in which the respiratory system in the adult, as well as in the larvæ, is completely modified for respiration of dissolved air. It is interesting to note that in the latter family the fore legs are not raptorial and that the rostrum is long and slender as in the Saldidæ. The length of the rostrum is thus seen to be connected with the presence of raptorial fore legs. The shortening is brought about by a reduction in the length of the third segment, since in all these predaceous Hemiptera the first two segments have already been greatly reduced in length to ensure flexibility of the rostrum.

The structure of the rostrum (labium), on which so much reliance has been placed by Reuter and other workers, is in fact dependent on mechanical necessity arising out of the mode of life, and is not necessarily of fundamental importance in the higher classification of the Heteroptera.

The marine Æpophilidæ, the relationships of which remained rather uncertain to Reuter are undoubtedly related to the littoral Acanthiidæ, and have evolved from that group in some such way as was suggested by the present writer in 1927 *.

The surface bugs of the families Gerridæ, Veliidæ, Hydrometridæ, Hebridæ, and Mesoveliidæ are obviously of monophyletic origin, and appear to have arisen from primitive Reduvioid forms by way of the early Nabidæ.

Considerable doubt has recently arisen as to the validity of the various Cimicoid families owing to the discovery of certain so-called annectent forms. A partial revision of these families by China and Myers † has shown that these forms can all be referred either to the Miridæ, Isometopidæ, Anthocoridæ, Microphysidæ, or Cimicidæ. The Termatophylidæ, however, can no longer be regarded as of family rank, Reuter's diagnosis being quite inadequate for the segregation of this group. In this connection it is worth while again to draw attention to the exaggerated importance

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* Ent. Mo. Mag. lxiii. p. 241 (1927).

† Ann. & Mag. Nat. Hist. (10) iii. pp. 97–125 (1929).

which Reuter gave to the arolia and claws as a guide to the family relationships, not only in the Miridæ, but in the Heteroptera as a whole. As pointed out by China and Myers [*] [†], these organs are far too plastic to serve as a fundamental group character.

The position of the family Termitocoridæ established by Silvestri just before Reuter's death has been ascertained by Myers [†] as close to the Aradidæ, and the name has been changed according to International Rules, to Termitaphididæ.

Within the last few years also the Notonectidæ have been shown to consist of three distinct families, the Pleidæ being revived, and a new family, the Helotrephidæ, established. These three families are of somewhat obscure origin, but form a natural group showing a definite sequence of specialization amongst themselves, the Notonectidæ being the most generalized, and the Helotrephidæ the most specialized [‡]. The Corixidæ are the only aquatic Hemiptera that are not predaceous. Their specialized habit is reflected in the extraordinary modifications (of the mouth-parts and fore legs, etc.) which effectively isolate them from the rest of the Heteroptera. The presence, however, of three pairs of abdominal scent-glands in the larvæ would seem to indicate a relatively recent origin from some terrestrial group rather than an origin from a predaceous littoral ancestor, although if, as suggested by Esaki and China [§], these glands are connected with a vegetarian diet, they may be of secondary origin in the Corixidæ. This idea is borne out by the similarity in the Micropylar apparatus of the egg in Notonectidæ and Corixidæ, as shown by Leuckart, and emphasized by Reuter, and by the absence of any great difference in the type of genitalia in the two groups as pointed out by Pruthi.

Probably the most outstanding event in the recent history of Hemipterology was the publication of Pruthi's monograph on the morphology of the male genitalia in Rhynchota [||]. A large amount of entirely new evidence at once became available to the student of Heteropterous phylogeny.

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[*] Ann. & Mag. Nat. Hist. (10) iii. pp. 97 125 (1929).

[†] 'Psyche,' xxxi. no. 6, pp. 259–278 (1924).

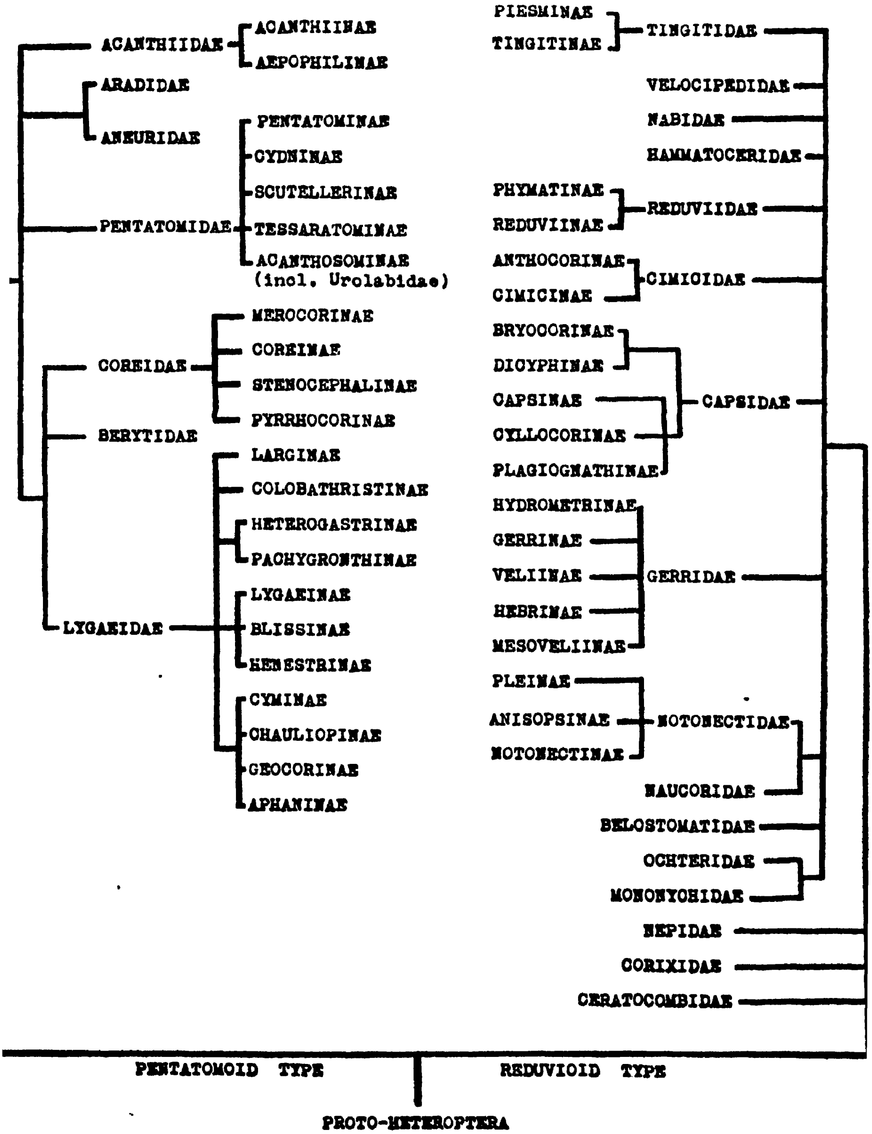
[‡] See Esaki & China, 'Eos,' iv. pt. 2, p. 170 (1928).

[§] *Loc. cit.* pp. 171–172 (1928).

[||] Trans. Ent. Soc London, 1926, pts. 1 & 2, pp. 127–267.

Classification of Heteroptera based on Genital Characters.

(All the families were not studied by Pruthi, so that the table is not quite complete.)



Pruthi came to the conclusion that there were only two main types of genitalia in the Heteroptera, the Pentatomoid type and the Reduvioid type, the first of these being divisible into two subtypes, the Pentatomoid and the Lygæoid subtypes. Some of the relationships suggested by his comparison of the genitalia are most startling. The Acanthiidæ for example should be separated from the Hydrobiotica and removed to the Pentatomoid group in the neighbourhood of the Aradidæ, although the Velocipedidæ should remain in the Reduviid group and should be associated with the Tingitidæ. The Nabidæ are also more closely related to the Tingitidæ than to the Reduviidæ. Only three types of genitalia are found in the Coreidæ, while the Pyrrhocoridæ are split up between the Coreidæ and the Lygæidæ, the Larginæ going to the latter. His conclusions may be summed up in the table on p. 193.

It will be seen that extraordinary changes would have to be made in Reuter's arrangement, if the classification were based on this one group of organs. But in general such an arrangement would merely tend to associate families with similar copulatory requirements irrespective of the actual ancestral relationships. This is instanced by the association of the Naucoridæ and Notonectidæ, and the dissociation of the Belostomatidæ and Nepidæ.

Although Pruthi did not claim that a classification should or could be based on any one set of organs, there was a tendency in his paper to exaggerate the importance of the genitalia in his estimate of the relationships of the families. There are no grounds for assuming that genitalia are less affected by environment and habits than are other characters. Indeed, the fact that whole groups of species exist which differ only in genital structures, would seem to indicate that these structures are the first to be affected. The fact that we get isolated genera like *Hammatocerus* obviously of Reduviid type, with highly differentiated genitalia, seems to minimize the value of genitalia as a criterion of the major classification. Nevertheless, in spite of such anomalies, the general plan of these structures is of considerable value when taken in conjunction with other characters, and offers valuable clues to the phylogeny of the group.

In a general way Pruthi's tentative classification into

Fig.

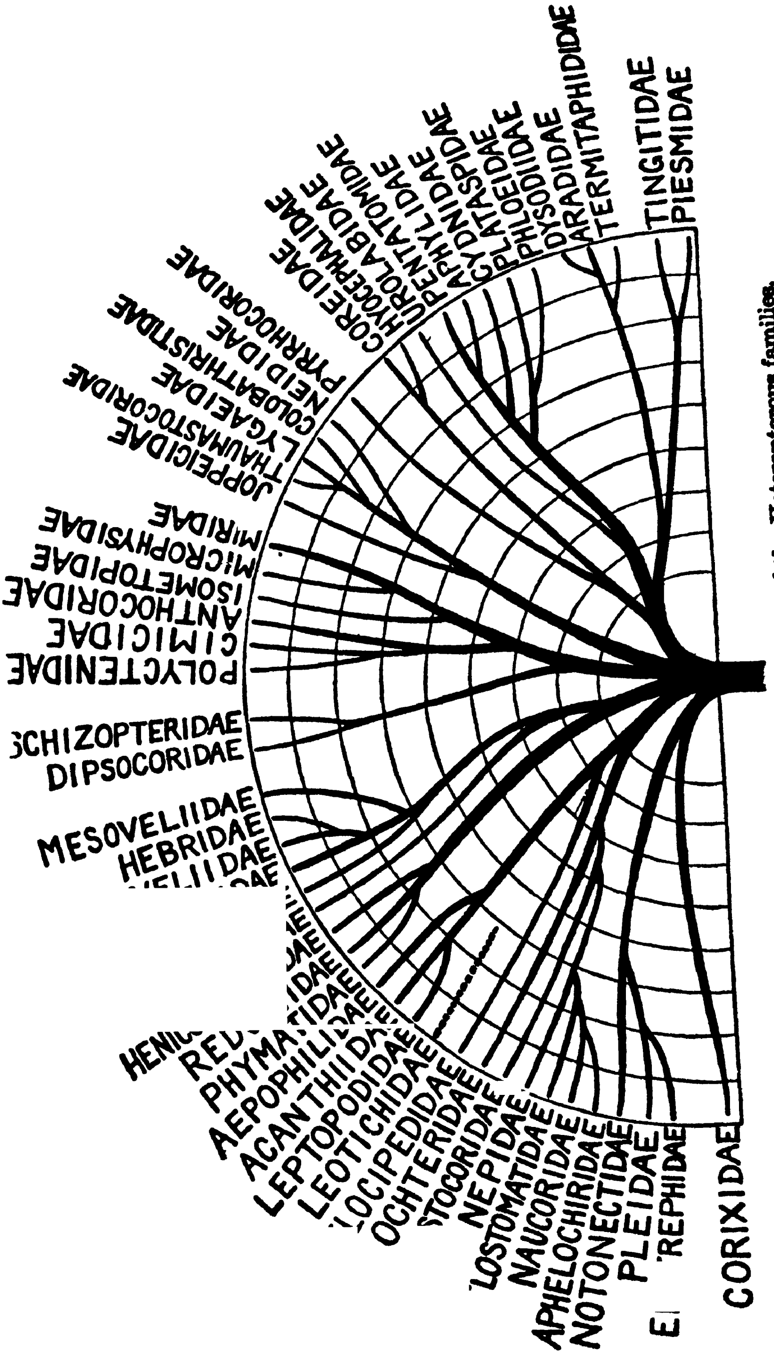


Diagram showing relationships and origin of the Heteropterous families.

the two Pentatomoid and Reduvioid types follows the biological difference in feeding habits found in the Heteroptera. The Pentatomoid group are mainly phytophagous and the Reduvioid group mainly predaceous. The carnivorous habits of the Pentatomid subfamily Asopinæ and the phytophagous habits of many Miridæ may be regarded as secondary. The Tingitidæ and Piesmidæ I consider as wrongly placed with the Reduvioid group. Pruthi regards the Reduvioid type as more primitive, and this is supported by Reuter's conclusion that the Ochteridæ are the most generalized of the Heteroptera. Nevertheless, the primitive Heteroptera were undoubtedly phytophagous, not predaceous, and were Homopteroid in character *. The Corixidæ may well represent the aquatic form derived from these ancestors, whereas the rest of the true aquatic bugs (as opposed to the littoral and surface forms), arose from predaceous terrestrial forms of the littoral type, at a much later date. The resemblance, in certain details, between the Tingitoideæ and the Reduvioid forms, can be explained by assuming that they have retained certain characters existing in the primitive Pentatomoid forms at the time when the first Reduvioid forms were arising from them. The more generalized condition of the present Reduvioid forms indicates that, at least with respect to the genitalia, they have changed less in the course of time than the Pentatomoid complex.

The "family tree" (p. 195) will indicate the relationships arrived at from recent studies.

XX.—*Observations on Post-larval Development in the Sponge* Iophon hyndmani (*Bowerbank*). By M. Burton, M.Sc., Assistant-Keeper, Department of Zoology, British Museum (Natural History).

Coalescence of Metamorphosed Larvæ.

The coalescence of larvæ, and of regenerative tissues, and the subsequent growth of the composite masses so formed into functional sponges has been demonstrated on several occasions under experimental conditions. The occurrence of such coalescence under natural conditions is less easy to demonstrate, but an example from Plymouth Sound, collected by me several years ago, seems to be clearly of this order. The particular specimen is of interest, too, in answering a question raised by Wilson (1907, pp. 254–255). In the course of experiments on the fusion of free-swimming larvæ, Wilson observed that:—"The smaller composite masses composed of as many as five or six larvæ metamorphose into perfect sponges. The larger masses composed of many larvæ did not metamorphose in my experiments, but experience with the regenerative tissue suggests that such masses would metamorphose if certain difficulties due to the great size of the mass were removed." He suggests that "this might be accomplished by cutting a flattened sheet composed of some hundred larvæ (such as I have produced) into pieces and inducing the pieces to metamorphose separately." In the specimen to be described, it is probable that, at a conservative estimate, some 70 larvæ have combined to form a single continuous incrustation.

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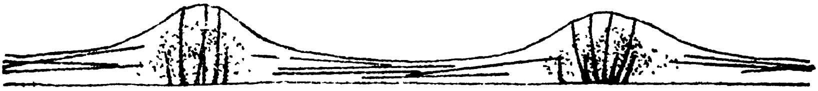
* Myers & China, Ann. & Mag. Nat. Hist. (10) iii. p. 293, 1929.

Fig. 1



Iophon hyndmani (Bowerbank).

Section at right angles to surface through a post-larval incrustation showing tufts of acanthostyli, and the pigmented tissues associated with them, and the tornota lying horizontally in the intermediate parts. (The distance between tufts of acanthostyli is usually much greater than is shown here.)

The specimen in question was obtained from Plymouth Sound in the last week of May, and consists of a thin incrustation of *Iophon hyndmani* (Bowerbank) of approximately 30 square cm. in extent, partially covering the surface of an irregular cube of coal of a volume of approximately 50 c.c. A number of barnacles (*Balanus* sp.) are also attached to the surface of the coal and are coated with the sponge. The plasmodium formed by the sponge is of irregular outline and measures mainly from ·2 to ·5 mm. thick, but in places is as much as 1 mm. thick. Under the microscope it has the reticulate appearance characteristic of regenerative masses experimentally produced (as in *Microciona prolifera*, Wilson, 1911, pl. ii. figs. 7–10, and *Haliclona longleyi*, de Laubenfels, 1932, pl. ii. fig. *b*). No oscules, pores, canals, or chambers could be discerned, the plasmodium consisting mainly of a granular semi-transparent sheet, with, in places, aggregations of pigmented cells (fig. 1). Spicules (acanthostyli of two sizes, tornota, anisochelæ, and bipocilla) are present in quantities, the microscleres scattered abundantly through the tissues, the tornota lying horizontally in the semi-transparent membranes, and the acanthostyli set in tufts echinating the substratum in the regions of the aggregations of pigmented cells. In this one respect, therefore, the naturally-produced plasmodia differ from those artificially produced: that whereas in the latter the chambers, canals, pores, and oscules are formed within seven days (approximately) and the skeleton does not begin to appear until about the tenth day (Wilson, 1911, p. 10), in the natural post-larval state the formation of the skeleton precedes the appearance of the canal-system.

The larvæ of *Iophon hyndmani* measure approximately ·4 mm. by ·4 mm., and the post-larval incrustation produced from a single larva would have, by comparison with known examples from other species, a surface-area of about ·2 sq. mm. On a conservative reckoning, therefore, the incrustation from Plymouth Sound must have been produced by the coalescence of some 70 or 80 metamorphosing larvæ. It appears probable, therefore, that under natural conditions larger numbers of larvæ will coalesce and thrive than is the case under experimental conditions. That the present specimen is the result of fusion of many larvæ, and not the result of growth from one or a few larvæ, may be deduced from the large area it covers, its age, and the abundance of its spicules. The first point need not be dwelt on, since a single post-larva could attain the surface-area of 20 sq. cm. only as the result of an extended period of growth. By comparison with recorded observations on post-larval growth (*e. g.*, Carter, 1874, p. 15), and on the growth of regenerative masses (*cf.* Wilson, 1911, and de Laubenfels, 1932), the present specimen cannot be more than a week old. The abundance of the spicules, also, suggests that the incrustation must be the result of something more than the product of a few larvæ.

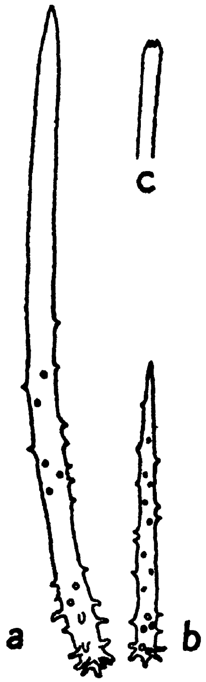
The age of the specimen can be reckoned with a fair degree of certainty, since in all cases so far observed the formation of the skeleton appears to follow the same lines in approximately the same times. The spicules lie at first horizontally to the substratum, and this condition is succeeded by one in which the principal megascleres become grouped in tufts at right angles to the substratum, the accessory spicules (when present), in this case the tornota, continue to maintain the horizontal position (fig. 1) (*cf.* with fig. 16, pl. iii. and p. 10, Wilson, 1911). This stage is reached, in the case of metamorphosed larvæ, in seven days or less, and in the case of experimentally-produced plasmodia within ten days or so. The absence of any trace of a canal-system suggests that the specimen of *Iophon hyndmani* was less than a week old (Carter, 1874, p. 15, figures an oscule in a specimen of *Adocia simulans* two days old).

Apart from the strong possibility that my specimen of *Iophon hyndmani* may represent a natural growth from the fusion of numerous metamorphosed larvæ, there is the added interest of finding in a natural state a post-larval plasmodium which in appearance and apparent behaviour (except for the relative times of appearance of skeleton and canal-system) is in all respects like the artificially-produced regenerative masses. And, although it has long been suspected that natural post-larval sponges and artificially regenerative plasmodia behaved fundamentally the same, the evidence rested almost entirely on deductions from larvæ and post-larvæ observed under aquarium conditions.

CHARACTERS OF THE SKELETON.

The spicules in this post-larval incrustation of *Iophon hyndmani* are: acanthostyli of two sizes, measuring ·32 by ·008 mm. and ·08 by ·008 mm. (exclusive of spines); tornota, ·2 by ·002 mm.; anisochelæ, ·014 to 0·24 mm.; and bipocilla, ·01 mm. In the holotype of the species the megascleres (fig. 2) measure: acanthostyli, ·2 by ·008 mm., and ·12 by ·008 mm. (exclusive of spines); and tornota, ·2 by ·003 mm. The microscleres have approximately the same dimensions as in the post-larva. There is, therefore, little difference in measurement between the spicules of the adult and those of the post-larva. In form, the only differences are that both kinds of acanthostyli are more copiously spined, and the spines in the larger of them extend practically to the apex. These things may be regarded as individual differences, since in other post-larvæ examined from the same collection the megascleres agree closely with those of the holotype (fig. 2).

Fig. 2.



Iophon hyndmani (Bowerbank).
from holotype : *a*, main acanthostylus ; *b*, echinating acanthostylus ; *c*, end of a tornote, × 400.

SUMMARY.

Observations on a post-larval specimen of *Iophon hyndmani* suggest that :—

1. The metamorphosed larva behaves in all respects like a plasmodium formed from regenerative cell masses, except that the appearance of the skeleton precedes the formation of the canal-system.

2. Under natural conditions many larvæ may coalesce to produce a single organism.

3. On leaving the parent the larvæ do not scatter but tend to settle in fairly localized groups [*].

4. The post-larval spicules do not differ from those of the adult.

List of Works referred to.

Carter, H. J. 1874. "Development of the Marine Sponges." Ann. & Mag. Nat. Hist. London, xiv. 1874, pp. 321–327, 389–406, pls. xx.–xxii.

de Laubenfels, M. W. 1932. "Physiology and Morphology of Porifera exemplified by *Iotrochota birotulata*, Higgin." Paps. Tortugas Lab. xxviii. 1932, pp. 37–66, 2 pls., 4 text-figs.

Wilson, H. V. 1907. "On some Phenomena of Coalescence and Regeneration in Sponges." J. Exper. Zoöl. Baltimore, v. (2) 1907, pp. 245–258, 4 figs.

——. 1911. "Development of Sponges from Dissociated Tissue-cells." Bull. Bur. Fish. Washington, xxx. 1911, pp. 1–30 (sep. copy), 5 pls.

XXI.—*Notes on Flatfishes* (*Heterosomata*).—V. *Four new Species from the Atlantic Coast of America.* By J. R. Norman, British Museum (Natural History).

Syacium longleyi, sp. n.

Closely related to *S. papillosum* (L.), but depth of body less than twice in the length. Interorbital width nearly equal to diameter of eye. Gill-rakers a little shorter and stouter, 7 on lower part of anterior arch. 46 to 48 scales in lateral line; supplementary scales less numerous. Dorsal (77) 79–81 (83) [†]. Anal 60–63 (65). Length of pectoral of ocular side about ¾ that of head, none of the rays prolonged.

Described from a single specimen, a male 132 mm. in total length, from off Breton Island, Louisiana; three small males, 58 to 100 mm. in length, from Key West, Florida, also belong to this species.

The specimen described above was received by the Museum in 1931 among a collection of Flatfishes purchased of the Caribbean Biological Laboratories, Inc.

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[*] This is also suggested by Carter's (1874, p. 17) and my own observations on *Sycon ciliatum*, in which the young sponges are often (usually ?) found in groups of 40 or 50, or more, in an area of a few square centimetres.

[†] The fin-ray counts in brackets were kindly given to me by Dr. Longley.

It appeared obviously distinct from the commoner *S. papillosum*, but I had hesitated to give a new specific name to a single specimen. However, on discussing the matter with Dr. W. H. Longley, I was interested to learn that he had met with the same flatfish at Tortugas and had been puzzled as to its identity. As he had seen a number of specimens, I have no hesitation in describing the species as new to science, and have much pleasure in associating Dr. Longley's name with it. The three Atlantic coast species of *Syacium* may be distinguished as follows :—

I. Interorbital width equal to or greater than eye (mature ♂), or about ⅔ eye (♀); 46 to 56 scales in lateral line.
  A. Depth 2⅕ to 2⅖ in length; 50 to 56 scales in lateral line; dorsal 82–91, anal 65–70 .... 1. *papillosum* (L.).
  B. Depth less than twice in length; 46 to 48 scales in lateral line; dorsal 77–83, anal 60–65 .... 2. *longleyi*, sp. n.
II. Interorbital width ¼ to ⅓ eye (mature ♂), or much narrower (♀); 54 to 65 scales in lateral line .... 3. *micrurum*, Ranzani.

Etropus longimanus, sp. n.

Etropus microstomus (*non* Gill), Regan, 1914, Rep. Brit. Antarct. ('Terra Nova') Exped. 1910, Zool. i. (1), p. 23.

Depth of body 2¼ to 2½ in the length, length of head 4 to 4⅖. Upper profile of head nearly straight; back not much elevated. Snout shorter than eye, diameter of which is 3⅖ to 3¾ in length of head; interorbital ridge moderately elevated; lower eye a little in advance of upper, which is very close to edge of head. Snout without scales. Maxillary extending to below anterior edge of eye or a little beyond, length 3¾ to 4 in that of head. Gill-rakers short, rather stout; 6 or 7 on lower part of anterior arch. Scales finely ctenoid on ocular side, cycloid on blind side; 43 to 47 in lateral line; no supplementary scales. Dorsal 79–85. Anal 60–73. Pectoral of ocular side with 9 rays, length 3 to 3⅖ in that of fish (without caudal). Uniformly brownish; dorsal and anal fins each with a row of small brown spots; pectoral with irregular brown cross-bars.

Hab. Coasts of Brazil and Argentina.

Described from 18 specimens, 35 to 115 mm. in total length. A female, 115 mm. in length, from C. Frio, Brazil, 40 fathoms ('Terra Nova'), is selected as the holotype.

Etropus intermedius, sp. n.

? *Etropus crossotus* (*non* Jordan & Gilbert), Ribeiro, 1915, Arch. Mus. nac. Rio de J. xvii. Heterosomata, p. 7.

Depth of body about twice in the length, length of head 4½ to 5. Upper profile of head nearly straight; back moderately elevated. Snout much shorter than eye, diameter of which is about 4 in length of head; interorbital ridge moderately elevated; lower eye scarcely in advance of upper, which touches dorsal profile of head. Snout and greater part of interorbital ridge without scales. Maxillary extending to below anterior part of eye, length about 4 in that of head. Gill-rakers short; 8 or 9 on lower part of anterior arch. Scales finely ctenoid on ocular side, cycloid on blind side; about 45 in lateral line; no supplementary scales. Dorsal 80–84. Anal 65–67. Pectoral of ocular side with 10 rays, length about 6 in that of fish (without caudal). Brownish, finely sprinkled with very small dusky spots; scales mostly with dark edges; median fins with small brown spots.

Hab. Atlantic coast of Tropical America, from Trinidad to Rio de Janeiro.

Described from three specimens, 90 to 122 mm. in total length. A female, 122 mm. in length, from Port of Spain, Trinidad, is selected as the holotype.

Parr * has recently published a valuable revision of the Western Atlantic species of *Citharichthys*, in which genus he includes the species with small mouth and with the dentition mainly confined to the blind side of the jaws, here regarded as constituting a distinct genus, *Etropus*. The five closely related species of *Etropus* from the Atlantic coast of America may be recognized by the following key:—

I. Depth more than twice in length; upper profile of head straight or a little concave; back not much elevated.
  A. Pectoral 4 to 5 in length of fish (without caudal); snout partly scaled; maxillary about 3½ in head; supplementary scales present; dorsal 67–81, anal 50–60 .... 1. *microstomus* (Gill).

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* 1931, Bull. Bingham Ocean. Coll. iv. (1).

B. Pectoral 3 to 3⅘ in length of fish (without caudal); snout without scales; maxillary 3¾ to 4 in head; no supplementary scales; dorsal 79–85, anal 60–73 .... 2. *longimanus*, sp. n.

II. Depth about twice in length; upper profile of head nearly straight; back moderately elevated; pectoral about 6 in length of fish (without caudal); no supplementary scales .... 3. *intermedius*, sp. n.

III. Depth less than twice in length; upper profile of head (in adults) more or less concave; back distinctly elevated.

A. Snout entirely covered with coarse ctenoid scales; supplementary scales present on body, numerous; about 5 gill-rakers on lower part of anterior arch; interorbital ridge high ...... 4. *rimosus*, Goode & [Bean.

B. Snout without scales; no supplementary scales on body; 6 to 9 (usually 7 or 8) gill-rakers on lower part of anterior arch; interorbital ridge rather low .... 5. *crossotus*, Jordan & [Gilbert.

Monolene antillarum, sp. n.

Monolene sessilicauda (part.), Goode & Bean, 1895, Ocean. Ichth. p. 452.

Monolene sessilicauda Garman, 1896, Bull. Lab. Nat. Sci. Univ. Iowa, p. 91.

Closely related to *M. sessilicauda*, but depth of body 3 to 3⅕ in the length, length of head 4½; upper profile of head less elevated above and behind eyes; diameter of eye 3¼ to 3½ in length of head; lower jaw a little longer and rather more vertical. 8 or 9 gill-rakers on lower part of anterior arch. 87 to 88 scales in lateral line. Dorsal 102–106. Anal 80–88. Pectoral with 12 to 14 rays, length ⅖ to ⅘ that of head. Brownish, with indistinct darker markings, of which those near edges of body are most prominent; pectoral with irregular blackish cross-bars, which are more distinct in its lower half.

Hab. Off the coast of Florida; West Indies.

Described from three specimens, 120 to 135 mm. in total length, of which a male, 135 mm. in length, from south of Tortugas, is selected as the holotype.

Readily distinguished from the more northerly *M. sessilicauda* by the narrower body, larger head and larger eye and pectoral fin; and from *M. atrimana* by the smaller number of dorsal and anal rays and by the smaller eye.

XXII.—*Trichoptera, Lepidoptera, and Coleoptera from Bear Island.* By DAVID LACK, B.A., from the Zoological Laboratory, Cambridge.

THE specimens recorded below were collected between June 20 and August 10, 1932, when G. C. L. Bertram and myself were on a small Cambridge expedition to the island. Bear Island lies 120 miles south of Spitsbergen, with which it is now included under the denomination of Svalbard. Its fauna was previously known only from the observations of a number of expeditions which stayed for a few days while on their way to Spitsbergen. The fauna of the latter is well known.

During the expedition's stay it was found possible to collect in all the main localities, so that the list below should be complete, unless there were any extremely local species, or any in which the imagines had not emerged before August 10. The latter contingency is unlikely, but it must be noted that the season of 1932 was extremely late. On June 20, the day of arrival, the snow had been gone some three days from the exposed parts of the island, and only a few of the smallest lakes had thawed. But summer conditions set in rapidly after this date.

The specimens have been divided between the British Museum (Natural History) and the Hope Department of the Oxford University Museum.

1. TRICHOPTERA.

Apatania arctica Boheman.

The first two imagines were taken from a small pond on July 7, and large numbers were found over most of the island on and after July 14. A large series, collected at intervals during the stay, was kindly identified by Mr. M. E. Mosely. All proved to be of this species, of which single females have been recorded from Bear Island by Koenig (7) and Summerhayes and Elton (4). The latter specimen was taken on July 17 or 19, considerably earlier than the first in 1932. The species is known also from Spitsbergen, where it was first recorded by Boheman in 1866 (2). Indeed, it is widely distributed in the Arctic. No other species of Trichoptera are known from Svalbard. Larvæ and cases found in a number of the lakes on Bear Island were presumably referable to the same species.

The present collection included two males, one taken *in coitu*. The male, which is rare and has not previously been recorded from Svalbard, was originally described by Sahlberg (9) under the name of *A. palméni*. Forsslund (5) and Mosely (8) have suggested that *A. palméni*, of which only the male was known, was really the male of *A. arctica*, of which only the female was known. The capture of a pair *in coitu* now proves this point.

2. LEPIDOPTERA.

Plutella maculipennis Curt.

One in north-east August 2, one at Tunheim August 10. On the latter date at least ten were seen as we walked down to the ship to embark. The two specimens were kindly identified by Mr. E. Meyrick. The species has not previously been recorded from Bear Island, but *Plutella* sp. has been recorded from Spitsbergen by four expeditions—Boheman (2), Holmgren (6), Eaton (3), Elton (4). Eaton in 1874 recorded the larvæ on *Draba*, and Stainton (10) agreed with Zeller that Eaton's specimens were referable to a distinct species *P. polaris*. The only specimen of *Plutella* taken since then was a single *P. maculipennis* by Elton. The occurrence of the latter on Bear Island is hence of interest. Since no larvæ or pupæ were found, and since the species is well known as a migrant, it is not certain that it is indigenous to Bear Island. But its mode of occurrence certainly suggests that it is, for, in the case of most insects indigenous to the island, a few individuals were found several days before the main mass emerged. Further, the nearest land, omitting Spitsbergen to the north, is some 250 miles to the south, a long distance. On August 10 and the preceding days there was a breeze from the east, and it seems most unlikely that so many individuals should have reached Bear Island simultaneously without the assistance of the wind. Since Tunheim was the base of the expedition, it is hardly possible that the individuals had arrived much earlier than August 10 and had been overlooked.

P. maculipennis is the only species of the order known from Bear Island, but other species have been obtained in Spitsbergen—Eaton (3), Elton (4), Thor (13).

3. COLEOPTERA.

The following specimens were kindly identified by Mr. K. G. Blair.

Staphylinidæ.

Micralymma marinum Stroem.

24, and larvæ, Framnes, 12. vii. to 5. viii.; 1, Herwigshamna, 9. vii.; and 5, K. Duner, 11. vii. All were under stones near the cliff-top, but not in areas of heavy bird-manuring. The species was recorded from Bear Island near Russehamna in 1899 by Aurivillius (1), and at K. Ruth in 1908 by Koenig (7).

Omalium septentrionis Th.

24, Fugleodden, 8. vii. to 5. viii.; 20, near Spitrefoss, 18. vii. (in both cases on cliff heavily manured by sea-birds, mainly under stones).

New to Bear Island.

Olophrum boreale Payk.

On cliff heavily manured by sea-birds, mainly under stones: 2, K. Kolthoff, 15. vii.; 9, Spitrefoss, 18. vii.; and 11, Brettingsdalen, 7. viii. Also 6 under stones inland at Laksvatnet, 10. viii., 28. vii., and one in stream draining this area Herwigshamna, 28. vii.

New to Bear Island.

Arpedium brachypterum Er.

On cliff heavily manured by sea-birds: 4, Fugleodden; 3, Spitrefoss; 1, K. Kolthoff; 7, Brettingsdalen (dates as above); under drift-wood near tide-line: 5, Evensenshamna, 8. vii.; 1, Walrus Bay, 18. vii.; also 5 under stones inland at north foot of Mount Misery, 2. vii., 6. vii. Previously recorded from Bear Island south of Mount Misery in 1899 by Aurivillius (1).

The specimens were all very black, perhaps a climatic effect as low temperature is known to make insects darker (Uvarov (14)).

Lathridiidæ.

Enicmus minutus Linn.

One at Laksvatnet, on water, 28. vii., one in nest of Snow-Bunting near the same place, 2. viii.

New to Bear Island.

Although there have been numerous expeditions to Spitsbergen, none of the above species have been recorded from there (omitting a record by Elton (4) of *E. minutus* from a ship). Possibly the Staphylinids may yet be found on some of the bird-cliffs, which are usually inaccessible. It is perhaps more curious that none of the four to six species recorded from Spitsbergen (Elton (4)) were found on Bear Island. The Spitsbergen species comprise a weevil and various Staphylinids, and none of the latter belong even to the same subfamily, the Omaliinæ, to which the four Staphylinids from Bear Island belong.

Micralymma marinum occurred at intervals round the coast, but was never found in company with the other three Staphylinids. The three latter were abundant only in areas heavily manured by sea-birds, and though *Olophrum boreale* and *Arpedium brachypterum* occurred each in one inland locality, they were here extremely sparse, while the specimens of the former were markedly smaller than those from the bird-cliffs. In more southern parts of their range these three species are much less restricted in habitat. That on Bear Island they were almost confined to bird-cliffs is presumably correlated with the great scarcity of decaying organic matter on the typical terrain of high Arctic regions. In the same way grasses, which in Norway are widespread, are almost confined on Bear Island and Spitsbergen to areas where bird-manure supplies them with a sufficiency of nitrogen salts, which cannot usually be found in these regions on unmanured ground (Summerhayes and Elton (12)).

The Staphylinids appeared to be feeding mainly on decaying matter. But *Arpedium brachypterum* was once recorded in the flower of *Saxifraga cæspitosa*, apparently feeding on nectar; in captivity it readily seized dead Collembola (*Achorutes viaticus* (Linn.)), but only once took a living specimen. The other three species could not be persuaded to eat living Collembola, but *Olophrum* *boreale* on two occasions took the spider *Coryphæus holmgreni* Thorell. Both the springtail and the spider were scarce or absent in most places where the beetles were common, and they were clearly not an important factor in the food of the latter.

It seems the rule in the Arctic generally, and was certainly true on Bear Island, to find a paucity of species but a great abundance of individuals. This suggests that *Enicmus minutus*, of which only two specimens were found, is of recent colonization. It was perhaps introduced by human agency, for there was a mining colony on Bear Island from 1915 to 1925. It is hence of interest that this should be the only species of beetle recorded from a ship in Spitsbergen by Elton (4).

Acknowledgments.

I am deeply indebted to Charles Elton, who made an ecological survey of the south of Bear Island in 1921, also to Dr. T. C. Longstaff, another member of that expedition, for their numerous kindnesses and most valuable information and advice concerning local conditions. For an account of the expedition and of those to whom it was indebted with regard to general organisation, see 'Geographical Journal,' Jan. 1933.

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(2) Boheman, C. H. 1865. "Spetsbergens Insekt-Fauna." Stockholm Öfv. Kongl. Vet-Ak. Förhandl. vol. xxii. pp. 563–577.

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XXIII.—*A new Ctenizid Spider from New South Wales.* By V. V. Hickman, B.A., B.Sc., Ralston Lecturer in Biology, The University of Tasmania.

Through the courtesy of Dr. E. C. Chisholm, I have received several spiders from Comboyne, New South Wales. Three female specimens which came to hand last year proved to belong to a new species in the genus *Arbanitis* L. Koch. I have named the species *Arbanitis chisholmii* in honour of the discoverer.

Most of the Australian spiders belonging to this genus have been described by Rainbow and Pulleine in Records Aust. Museum, vol. xii. no. 7. In carefully reading the descriptions of species in this paper, several errors have been noted. On page 115, in the description of the eyes of *Arbanitis elegans*, the rear row is said to be "recurved on its front line and recurved behind." This does not accord with the diagram given nor with the normal arrangement of eyes in the genus. The rear row in the diagram is shown to be procurved on its front line. On page 109, in the table given in elucidation of the species, the front middle eyes of *A. maculipes* Hogg are said to be "nearly twice their individual diameter apart," whereas Hogg, in describing this spider, states that they "are not quite their diameter apart."

Descriptions of Australian spiders frequently fail to exphasise sufficiently the importance of negative characteristics. Unless the absence of a particular feature is definitely stated in describing a new species, students are always left in doubt as to whether the feature is or is not possessed by the species concerned.

A synopsis of the recorded Australian species of

Arbanitis is given hereunder, followed by a description of *Arbanitis chisholmii*, sp. n.

Family **Ctenizidæ.**

Genus ARBANITIS L. Koch.

Synopsis of Species.

The females of the known Australian species in the genus *Arbanitis* may be distinguished as follows :—

1.	Labium with spines	2.
	Labium without spines................	4.
2.	Rear lateral eyes smaller than the front lateral eyes	*A. elegans* R. & P.
	Rear lateral eyes equal in size to the front lateral eyes	3.
3.	Promargin of falx-furrow armed with two large teeth	*A. longipes* L. Koch.
	Promargin of falx-furrow armed with eight large teeth	*A. inornatus* R. & P.
4.	Maxillæ without spines................	5.
	Maxillæ with spines	7.
5.	Thoracic fovea straight	*A. pulchellus* R. & P.
	Thoracic fovea procurved..............	6.
6.	Front median eyes large and separated by a space equal to 1/3 their individual diameter.........................	*A. fuscipes* Rainbow.
	Front median eyes small and separated by a space equal to once their individual diameter	*A. similaris* R. & P.
7.	No scopula on tarsi or metatarsi of second pair of legs........................	*A. maculipes* Hogg.
	Scopula present on tarsi and metatarsi of second pair of legs	8.
8.	Rear lateral eyes larger than front lateral eyes.............................	*A. festivus* R. & P.
	Rear lateral eyes equal to or smaller than front lateral eyes	9.
9.	Front median eyes larger than front lateral eyes	*A. papilliosus* R. & P.
	Front median eyes equal to or smaller than front lateral eyes	10.
10.	Teeth present on retromargin of falx-furrow	11.
	Teeth absent from retromargin of falx-furrow..........................	13.
11.	Front median eyes separated by half their individual diameter	*A. hirsutus* R. & P.
	Front median eyes separated by once their individual diameter	12.
12.	All sternal sigilla marginal.............	*A. gracilis* R. & P.
	Posterior sternal sigilla submarginal	*A. montanus* R. & P.
13.	Ventral spines on tarsi of first pair of legs.	*A. mestoni* Hickman.
	No spines on tarsi of first pair of legs ...	14.
14.	Posterior sternal sigilla large and removed from margin	*A. chisholmii*, sp. n.
	Posterior sternal sigilla small and near the margin	*A. scaurus* Hickman.

(R. & P. = Rainbow and Pulleine.)

Description of Arbanitis chisholmii, *sp. n.*

Female.—Holotype, ♀, will be deposited in the Australian Museum, Sydney.

Measurements (in millimetres) :—

Total length (excluding chelicerae)	26·0
Length of cephalothorax	12·0
Width of cephalothorax	8·0
Length of abdomen	14·0
Width of abdomen	9·0
Length of chelicerae	4·1

	Trochanter and Femur.	Patella.	Tibia.	Meta-tarsus.	Tarsus.	Total.
Leg 1	10·5	4·5	6·0	4·2	3·5	28·7
2	8·5	4·2	4·7	4·1	3·2	24·7
3	6·0	4·0	3·2	3·5	3·0	19·7
4	9·0	5·0	6·0	5·2	4·0	29·2
Palpi	8·0	3·4	3·8	—	4·5	19·7

Width of first patella at " knee " 1·68 mm. ; tibial index 16.
Width of fourth patella at " knee " 1·91 mm. ; tibial index 17.

Cephalothorax.—Oblong, truncate in front. Sides not strongly curved. Rear margin slightly recurved. Brown in colour with a yellowish-brown patch in front of eyes. A group of bristles in front of eyes and between the posterior median eyes. A median row of nine or ten bristles extends from the ocular area to the fovea. Cervical groove marked by a deep depression on each side of the cephalic region. Immediately above this depression is a patch of fine yellowish-grey recumbent hairs pointing towards the rear. Margin of cephalothorax lightly fringed with fine bristles. Thoracic fovea 8·0 mm. from front margin, deep, wide, and straight. Radial grooves marked by distinct indentations.

Eyes.—The eye-group is almost rectangular, wider than long, in ratio 3 : 2. Eye-tubercle transversely oval and moderately high. PME of the nocturnal type. Front row of eyes strongly procurved, rear row almost straight on anterior edges. Ratio of eyes AME · ALE : PME : PLE=9 : 10 : 4 : 7. AME are separated from each other by 6/9 of their diameter. ALE are separated by three times their diameter. The lateral eyes of the one side are separated by 7/5 of the diameter of ALE. The distance separating PME is equal to 9/2 of their own long diameter. ALE removed from front edge of carapace by 6/7 of their diameter. A group of bristles in front of AME. The eye-tubercle is marked with black as indicated by shading in fig. 1.

Legs.—4 . 1 . 2 . 3. Brown, clothed with coarse black hairs. First and second tarsi heavily scopulated. First and second metatarsi scopulated in distal two-thirds. Two converging rows of trichobothria on each tibia, a straight row on each metatarsus, and a zigzag row on each tarsus (fig. 2, A). Three tarsal claws. Superior claws well curved. Each is armed on the inner side near the base with one large and three small teeth. The inferior claw is small and bare (fig. 2, B).

Fig. 1.

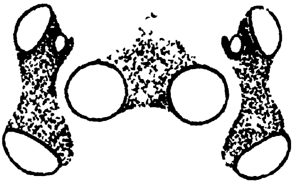
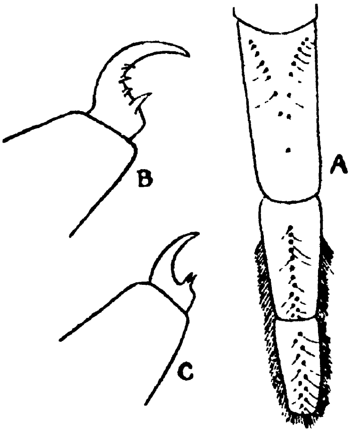


Fig. 2.



Arbanitis chisholmii, sp. n., ♀.

Fig. 1.—Eye-group.

Fig. 2.—A. Tarsus, metatarsus, and tibia showing the trichobothria on dorsal surface of first leg. B. One of the upper claws of second leg showing the teeth on inner side. C. Palpal claw.

Palpi.—Similar in colour and clothing to the legs. Tarsal segment heavily scopulated. Trichobothria on tibia and tarsus. Tarsal claw armed with two teeth close together (fig. 2, C).

Spines.—*First leg.* Femur 0. Patella 0. Tibia: ventral 1—1—1—2, elsewhere 0. Metatarsus: retrolateral 1 at apex, ventral 2—1—2. Tarsus 0. *Second leg.* Femur 0. Patella 0. Tibia: ventral 1—1—1, elsewhere 0. Metatarsus: retrolateral 1—1—1, ventral 2—1—2, elsewhere 0. Tarsus: ventral 1, elsewhere 0.

Third leg. Femur 0. Patella : prolateral 9 grouped as in a rastellum, elsewhere 0. Tibia : dorsal 0, prolateral 1—1, retrolateral 1—1—1 all short, ventral 2—2 bristles. Metatarsus : dorsal 2—2—2, prolateral 1, retrolateral 1—1—1, ventral 1—2—3. Tarsus : ventral 7 in a group near apex, elsewhere 0. *Fourth leg.* Femur 0. Patella 0. Tibia : ventral 2 large bristles near apex, elsewhere 0. Metatarsus : retrolateral 3 at apex, ventral 1—2—1—2, elsewhere 0. Tarsus : dorsal 0, prolateral 1—1—2—1—2, retrolateral 1—1—1, ventral 1—2. *Palpi.* Femur 0. Patella 0. Tibia : dorsal 0, prolateral 1—1—1, retrolateral 0, ventral 2—2—2. Tarsus : dorsal 0, prolateral 2—1, retrolateral 1, ventral 0.

Fig. 3.

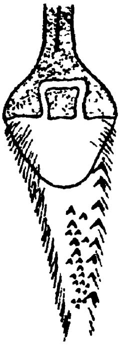
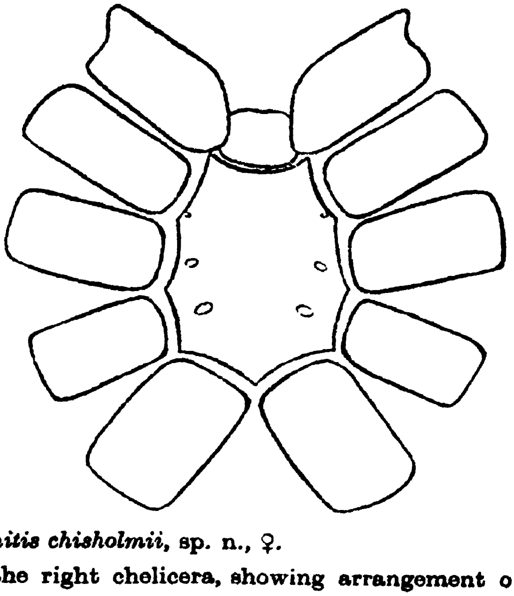


Fig. 4.



Arbanitis chisholmii, sp. n., ♀.

Fig. 3.—Ventral view of the right chelicera, showing arrangement of teeth.

Fig. 4.—Sternum, sigilla, labium, maxillæ, and coxæ.

Cheliceræ.—Black, clothed with black bristles in longitudinal patches. Fang long, black, well curved, and possessing a ventral keel. Promargin of furrow armed with eight strong teeth, while twenty-two smaller teeth occupy the furrow (fig. 3). Retromargin fringed with long reddish hairs. The rastellum consists of a group of about twelve strong spines in the usual position.

Maxillæ.—Longer than wide, in ratio 16 : 9, brown, convex, excavated round labium. Inner basal angle furnished with a group of about thirty-eight small spines. Promargin fringed with a scopula of long reddish hairs. Surface clothed with long black hairs and bristles.

Labium.—Brown, submerged, convex, wider than long, in ratio 7 : 5. Front margin slightly procurved. Surface clothed with long black bristles. Spines absent.

Sternum.—Brown, clothed with black bristles. Longer than wide, in ratio 7 : 6. The greatest width is between coxæ of third pair of legs. Procurved in front round base of labium, from which it is separated by a deep groove. Pointed in rear. The coxæ of the fourth pair of legs just meet in rear of sternum (fig. 4). Three pairs of sigilla, rear pair largest and removed from the margin by a space equal to one and a quarter times their long diameter ; the second pair nearer the margin ; the anterior pair small and marginal.

Abdomen.—Dark brown above and on ventral surface. Clothed with simple black hairs and long thin bristles. Lung-covers yellowish brown and clothed with hairs. Spinnerets yellowish. Inferior pair 1·2 mm. long, contiguous, apex rounded. Superior pair 3·5 mm. long, three-jointed, tapering, separated at the base by about once their diameter.

Locality.—Comboyne, New South Wales, March 1931.

Field-notes.—The specimens were collected by Dr. E. C. Chisholm, to whom I am indebted for the following notes on the ecology of the species:—The burrow made by the species varies in depth from 18·4 cm. to 22·2 cm. and has a diameter of from 20·0 mm. to 25·4 mm. The width is uniform throughout. A lining of silk entirely covers the wall of the burrow. The opening of the burrow is never closed with a lid or provided with a turret of earth. Amongst grass, however, the inner silken lining of the burrow is sometimes attached to the grass-stalks a little above ground-level. The nest is a simple tube and there is no lateral branching. At the end of the burrow the spider is enclosed in the silk lining, as if in the end of a glove-finger. The soil in which the nests are made is of red basaltic formation, very porous and almost free from stones and pebbles; there is no sand and very little clay. The nests occur in a number of different situations—*e. g.*, in open grass-lands, amongst bracken, in decayed tree-stumps, sometimes near water and at other times away from it.

When dug out of its burrow the spider simulates death, but on being roused it becomes very pugnacious and strikes in the manner characteristic of the Mygalomorphæ.

XXIV.—*The Genus* Smicridea *McLach.* (*Trichoptera*) *in Tasmania.* By Martin E. Mosely, F.R.E.S.

[Plate VIII.]

The genus *Smicridea* was erected by McLachlan to take a group of small insects recorded as occurring in North and South America, but differing from all other genera in the Hydropsychidæ, as then understood, in having a single spur on the anterior tibia instead of the customary two. The range of the genus was subsequently extended by Ulmer to Australia when he transferred *Hydropsyche edwardsi* McLach. to *Smicridea*; and now we have a Tasmanian species, new to science, which also belongs here. *S. edwardsi* too has been discovered on the island.

Smicridea is very closely allied to *Diplectrona*. The abdomen is furnished with a pair of lateral filaments more or less developed, and in many of the species there are also the internal abdominal tracheal (?) bodies recorded in the latter genus, and illustrated here on Pl. VIII. fig. 3. Up to the present I have found these bodies in the *Smicridea* species *australis* Ulmer, *murina* McLach., *albosignata* Ulmer, *aterrima* Ulmer, and *nigripennis* Banks, and no doubt they occur in other species as well. All these species belong to McLachlan's original form with spurs 1 . 4 . 4 .

Since the days of McLachlan it has been found necessary, with a wider knowledge of the order and with a view to avoiding an undue multiplication of genera, to disregard to a large extent the number and arrangement of the spurs as of generic importance, though these, in combination with other characters, have an undoubted value.

In *edwardsi* and the new species described in this paper the spurs are 2 . 4 . 4 instead of 1 . 4 . 4, and the abdominal bodies are reduced to a pair of small reticulated expansions of the base of the filaments.

The main distinction between *edwardsi* and *grisea*, sp. n., lies in the shape and vestiture of the wings. In *grisea* the anterior wings are mottled and streaked with very dark grey; in both species the posterior wings are of a snowy white and very opaque. In *edwardsi*, which seems in Tasmania to be more local than *grisea*, the anterior wings are also white, rather broader than those of *grisea*, and bear a few irregular and variable dark marks or spots, the posterior wing being exceptionally dilated along the posterior margin. Fork 2 of the anterior wing has a foot-stalk, but in *grisea* this fork is sessile.

Both species are known to trout-fishermen of these parts as " snow-flake flies," and according to Tillyard they " fly in clouds on the mountain-streams in the late afternoon, rising and falling rythmically, and giving the appearance of a miniature snow-storm."

Smicridea grisea, sp. n. (Pl. VIII. figs. 1 & 2; text-figs. 1–3.)

Head.—Black clothed with black hairs; antennæ dark ochraceous with light fuscous annulations; palpi light fuscous, first, second, and third joints short, about equal in length, fourth twice as long as the third, fifth about as long as the second, third, and fourth together.

Wings.—Anterior silvery grey with numerous fuscous patches as indicated on Pl. VIII. fig. 1; fork 2 sessile. Posterior wing opaque snowy white, posterior margin not unduly dilated, fringes white.

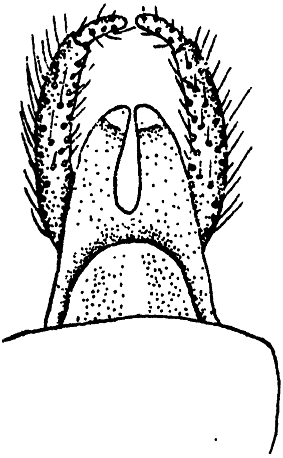
Legs.—Anterior and median dark fuscous sparingly clothed with light-coloured hairs; posterior cream-coloured with heavy white silky fringes. Spurs 2 . 4 . 4.

Abdomen.—Dark reddish fuscous, lateral filaments strongly developed.

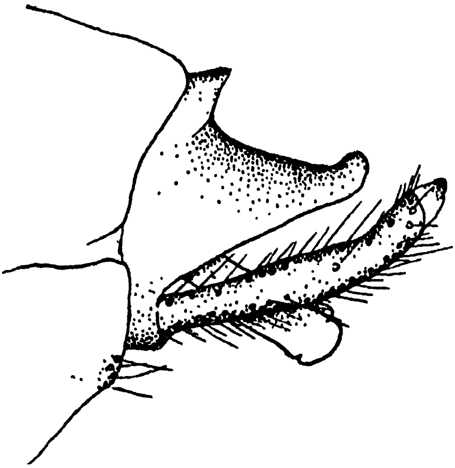
Genitalia (♂).—Dark ochraceous in colour; margin of the terminal dorsal segment produced at its centre in a strongly chitinized rounded plate, from the side triangular, with an acute apex directed upwards. Welded to this plate is a pair of superior appendages united at their bases to about half their length, lying very close to each other with the apices slightly upturned; from the side the segment and appendages form a broad triangle with the upper margin deeply excised. Penis with very slight angular dilatations on each side towards the base and small rounded processes at each angle of the truncated apex. Inferior appendages two-jointed, basal joint long, terminal joint rather short.

♀.—Somewhat larger than the ♂, median legs dilated, anterior wings indistinctly marked with greyish, posterior wings greyish.

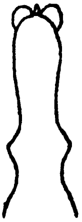
Text-fig. 1.



Text-fig. 2.



Text-fig. 3.



Smicridea grisea, sp. n., ♂.

Fig. 1.—Genitalia, dorsal.
Fig. 2.—Genitalia, lateral.
Fig. 3.—Penis, dorsal.

Length of anterior wing, ♂ 8 mm., ♀ 11 mm.

Type (♂), Miena, Great Lake, Tasmania, 3300 ft., Dec. 1929 (*H. M. Stephens*), in the author's collection. *Paratypes* (♂ & ♀) bearing similar labels in the author's and British Museum collections.

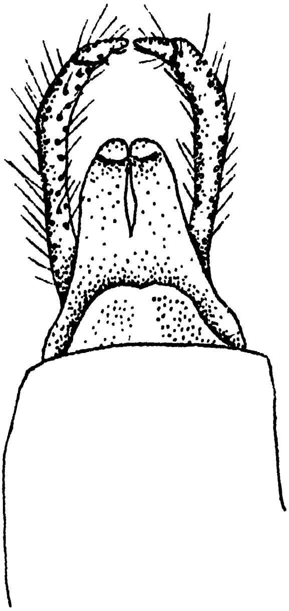
Smicridea edwardsi McLachlan. (Pl. VIII. figs. 4, 5; text-figs. 4, 5.)

Smicridea nivea Ulmer.

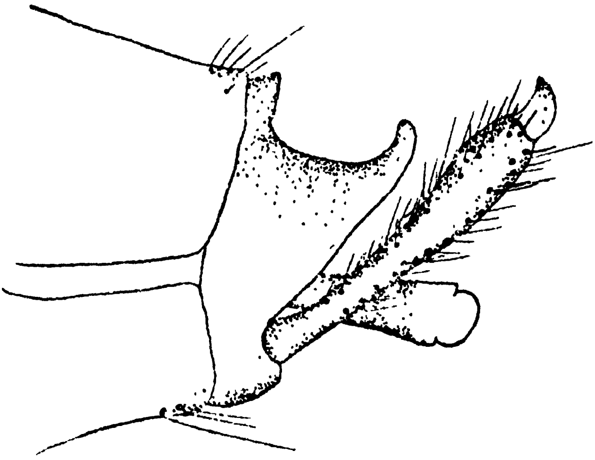
Head.—Dark fuscous, nearly black, clothed with white hairs; antennæ pale cream-colour, the distal end of each joint, particularly on the upper surface, marked with a dark fuscous patch; palpi ochraceous.

Wings.—Both snowy white, anterior bearing a few yellowish-brown spots as shown in the photograph (Pl. VIII. fig. 5), but varying in individuals. Fork 2 of the anterior wing with a foot-stalk; fringes yellowish; posterior wing opaque snowy white, posterior margin much dilated, fringes white.

Text-fig 4.



Text-fig. 5.



Smicridea edwardsi McLach., ♂.

Fig. 4.—Genitalia, dorsal.
Fig. 5.—Genitalia, lateral.

Legs.—Ochraceous, posterior heavily fringed with silky white hairs. Spurs 2.4.4.

Abdomen.—Very dark reddish fuscous.

Genitalia (♂).—Cream-coloured and almost similar to those of *S. grisea*, but the upper margin of the fused superior appendages and terminal dorsal plate is perhaps more deeply excised; margin of terminal dorsal plate from above with a minute central excision (possibly abnormal).

Length of anterior wing, ♂, 9 mm.

Two males in the author's collection labelled "Tasmania, Perth, R. Esk, Jan. 1930" (*H. M. Stephens*).

Described Species of Smicridea.

S. æqualis Banks. (British Guiana.)
Bull. Mus. Harv. lxiv. p. 358, pl. v. fig. 58 (1920).

S. albifrontalis Martynov. (Peru.)
Ann. Mus. Zool. St. Petersb. xvii. p. 25, figs. 38–40 (1912).

S. albosignata Ulmer. (Brazil.)
Notes Leyden Mus. xxix. p. 34, figs. 49–51 (1907).

S. aterrima Ulmer. (Argentine.)
Ann. Soc. ent. Belg. lv. p. 19, figs. 5, 6 (1911).

S. australis Ulmer. (Australia.)
Hamb. Südwest Aust. Exped. ii. p. 35, figs. 13–15 (1908).

S. bidentata Martynov. (Peru.)
Ann. Mus. Zool. St. Petersb. xvii. p. 24, figs. 33–37 (1912).

S. comma Banks. (Cuba.)
Bull. Mus. Harv. lxv. p. 451 (1924).

S. divisa Banks. (Arizona, New Mexico.)
Proc. Ent. Soc. Wash. v. p. 244, pl. iv. fig. 12 (1903).

S. edwardsi McLach. (Queensland, Australia.)
Trans. Ent. Soc. Lond. (3) v. p. 269, pl. xvii. fig. 7 (1866); Ulmer, Arkiv für Zool. x. no. 13, pp. 13–15, figs. 18–20 (1916).

S. fasciatella McLach. (Texas.)
Journ. Linn. Soc. Lond. Zool. xi. p. 136, pl. iv. fig. 19 (1871).

S. grisea, sp. n. (Tasmania.)

S. maculata Banks. (Brazil.)
Bull. Mus. Harv. lxiv. p. 359, pl. v. fig. 66 (1920).

S. murina McLach. (Chile.)
Journ. Linn. Soc. Lond., Zool. xi. p. 137, pl. iv. fig. 21 (1871).

S. nigripennis Banks. (Columbia.)
Bull. Mus. Harv. lxiv. p. 359, pl. v. fig. 56 (1920).
(? Syn. *albosignata* Ulmer.)

S. nivea Ulmer.
Stett. ent. Zeit. lxvi. pp. 104–105, pl. iv. figs. 136–137 (1905).
(Syn. *S. edwardsi* McLach.)

S. polyfasciata Martynov. (Peru.)

Ann. Mus. Zool. St. Petersb. xvii. p. 22, figs. 28–32 (1912).

S. saucia McLach. (Peru.)

Journ. Linn. Soc. Lond., Zool. xi. p. 137, pl. iv. fig. 20 (1871).

EXPLANATION OF PLATE VIII.

Figs. 1, 2. *Smicridea grisea*, sp. n., ♂. Wings.
Fig. 3. Internal abdominal tracheal bodies in *Smicridea australis* Ulmer.
Figs. 4, 5. *Smicridea edwardsi* McLach., ♂. Wings.

XXV.—*A Note on the Synonymy of* Cricetulus barabensis *Pallas*. By J. L. Chaworth-Musters.

In 1773 Pallas (‘Reise,’ vol. ii. p. 704) described, from the Barabensian steppes in S.W. Siberia, a small striped hamster under the name of *Mus barabensis*. This species is at once distinguished from his *Mus sungorus* by its longer tail, and whereas to-day *Mus sungorus* of Pallas is regarded as belonging to the genus *Phodopus* of Miller, *Mus barabensis* not only belongs to but, as I show further on, is the type of the genus *Cricetulus* of Milne-Edwards. The locality whence Pallas's specimens of *Mus barabensis* were obtained is given in the appendix (*loc. cit.*) as “arenosis ad Ob fluvium non longe ab argentaria fabrica quae a S. Paulo nomen habet.” Reference to the text confirms this locality (*loc. cit.* vol. ii. p. 636), and shows us that his specimens came from the Kasmalinskoi-Bor near Pawlowsk, which is situated on the right bank of the Kasmala River, a tributary of the Ob west of Barnaul.

In 1778 Pallas (‘Glires,’ p. 273) redescribed this species as *Mus furunculus*. As the first locality given, between the Kasmala and Barnaul Rivers, may be regarded as identical with the type-locality of *Mus barabensis*, there can be no doubt as to the subspecific identity of the two forms. The reason that Pallas changed the name of his *Mus barabensis* to *Mus furunculus* was because he identified it with the *Furunculus myodes* of Messerschmid (Mus. Imp. Petrop. vol. i. p. 343, 1742).

As Messerschmid's description is pre-Linnean, no notice need be taken of it.

In 1867 Milne-Edwards (Ann. Sci. Nat. vol. vii. p. 376) described from the neighbourhood of Pekin * a small striped hamster as *Cricetulus griseus.* Although differing slightly from specimens from Southern Siberia, I can see no adequate reason, from the material examined, why this form should be considered more than a subspecies of *Cricetulus barabensis.* As *C. griseus* is given by Milne-Edwards as the type of the genus *Cricetulus*, and it is shown to be a subspecies of *C. barabensis*, *C. barabensis griseus* will in future have to be regarded as the type of the genus.

Further, Milne-Edwards (Rech. Mamm. p. 136, 1868) described from Sartchy, on the Hoang-ho, his *Cricetus* (*Cricetulus*) *obscurus*, and Oldfield Thomas (Proc. Zool. Soc. 1908, p. 107) gives good reasons for considering this form as a subspecies of *C. griseus.*

Oldfield Thomas (Proc. Zool. Soc. 1888, p. 134, footnote) renames Milne-Edwards's *Cricetus obscurus Cricetus mongolicus*, as in this paper he united the genus *Hesperomys* with *Cricetus*, and, therefore, *Cricetus obscurus* Milne-Edwards became antedated by *Hesperomys obscurus* Waterhouse. So long as the genera *Cricetulus* and *Hesperomys* are considered distinct, no notice need be taken of this renaming except in synonymy ; but, should the two genera be united, the subspecific name "*mongolicus*" of O. Thomas will have to be used.

It is obvious that *Cricetulus griseus fumatus* Oldfield Thomas becomes a subspecies of *C. barabensis*, and I can see no reason why *Cricetulus manchuricus* Mori should be considered specifically distinct from *C. griseus.*

It is probable that both *Cricetulus dichrootis* and *Cricetulus koslovi* Satunin ("Neue Nagetiere aus Centralasien," Ann. Mus. Zool. Acad. Imp. Sci. St. Petersburg, vol. vii. pp. 567–571, 1903) are closely related to this species, but in the absence of comparative material I have not included them as races of it.

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* No locality is given in the original description, but in Rech. Mamm. (p. 133) Milne-Edwards gives "les environs de Pekin." O. Thomas (in MS.) writes: "Specimens marked type in Paris Museum from Suen-hoa-fu, near Kalgan."

The synonymy of *Cricetulus barabensis* Pallas may be expressed thus :—

CRICETULUS.

Milne Edwards, Ann. Sci. Nat. vol. vii. p. 375, 1867.

Type. *Cricetulus griseus* = *Cricetulus barabensis*.

Cricetulus barabensis barabensis.

1773. *Mus. barabensis* Pallas, Reise, vol. ii. p. 704.
1778. *Mus furunculus* Pallas, Glires, p. 273.

Type-loc. Kasmalinskoi-Bor, Pawloswk, near Barnaul, S.W. Siberia.

Cricetulus barabensis griseus.

1867. *Cricetulus griseus* Milne-Edwards, Ann. Sci. Nat. vol. vii. p. 376.

Type-loc. Suen-hoa-fu, near Kalgan, Mongolia.

Cricetulus barabensis obscurus.

1868. *Cricetus* (*Cricetulus*) *obscurus* Milne-Edwards, Rech. Mamm p. 136.
1888. (*Cricetus*) *mongolicus* Oldfield Thomas, Proc. Zool. Soc. 1888 p. 134 (footnote).

Type-loc. Sartchy, Hoang-ho, inner Mongolia.

Cricetulus barabensis fumatus.

1909. *Cricetulus griseus fumatus* Oldfield Thomas, Ann. & Mag. Nat. Hist. ser. 8, vol. iv. p. 503.

Type-loc. Chu-Chia-Tai, near Chang-Chun, Kivin Prov., Manchuria.

Cricetulus barabensis manchuricus.

1930. *Cricetulus manchuricus* Mori, Annot. Zool. Jap. vol. xii. p. 417.

Type-loc. Harbin, North Manchuria.

BIBLIOGAPHICAL NOTICE.

The Nidification of the Birds of the Indian Empire. By E. C. STUART BAKER, C.I.E., O.B.E., F.Z.S., &c. Vol. II. Pp. vii+564, and 6 Plates. Taylor & Francis, Red Lion Court, Fleet Street, London, E.C. 4. Price 30*s*.

WE welcome the second volume of this important ornithological work. This volume completes the descriptions of the nests and eggs of the great Passerine order of birds, and comprises twelve families with 403 species and subspecies.

The families dealt with are the Thrushes and their near allies, Flycatchers, Shrikes, Minivets, and Cuckoo-Shrikes, Swallow-Shrikes, Drongos, Warblers, Goldcrests, Fairy Blue-Birds, Orioles, Grackles, and Starlings, but the Thrushes, Flycatchers, and Warblers alone occupy about three-fourths of the volume.

The high quality of vol. i. is fully maintained, and the descriptions of both nests and eggs are given in wonderful detail.

Mr. Baker draws on his own exceptional knowledge for his accounts of the breeding of the birds found in Assam. For other parts of India, Burma, and Ceylon he has incorporated the notes and observations of A. O. Hume, Hodgson, Jerdon, and a large number of more recent naturalists.

The numbering of the species and subspecies agrees with that of the revised edition of the 'Fauna of British India.' This was essential for easy reference.

The author points out that, of the 540 species and subspecies described in the 'Fauna' under the families dealt with in this volume. 75 do do not breed within the limits of the Indian Empire. This leaves 465 species nesting in this area, of which 403, or nearly 87 per cent., have actually been found, and the nidification of these is described in this volume, leaving only 62 for future discovery. Thus there is still work to be done by the rising generation of ornithologists in India and Burma. Moreover, it must be borne in mind that the information already collected on the breeding-habits, nests, and eggs of the birds already described is rarely complete. We want to know more upon various points, such as which of the sexes, one or both, undertake the construction of the nest, which does duty in incubation, what is the period of incubation, &c. Courting displays have, moreover, been very inadequately dealt with, and will well repay study.

From a perusal of this and the previous volume it will be noticed that the nests and eggs of allied subspecies are usually very similar and the eggs inseparable. This is not, however, invariably the case; for example, the eggs of *Rhodophila ferrea haringtoni*, the Burmese form of the Dark Grey Bush-Chat, differ from those of *Rhodophila ferrea ferrea*, the western form, by being spotless blue, those of the latter being blue, spotted and freckled with red.

The book is full of interest to all lovers of birds in India, and will be welcomed by them. It contains a fund of well-arranged information, and it brings our knowledge of the breeding of our Indian birds up to date.

It is provided with a good index and has several excellent plates (photographs by Bates). It should be in the hands of every ornithologist in India, Burma, and Ceylon.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 69. SEPTEMBER 1933.

XXVI.—*Notes on the Neogene Faunas of Cyprus.*

By F. R. Cowper Reed, Sc.D., F.G.S.

[Plate IX.]

(1) The Clypeaster Horizon.

The Clypeaster bed of Cape Pyla, which was discovered by Miss Bate in 1904, was referred by Dr. Bather to the Helvetian on the strength of the occurrence of *Clypeaster altus* var. *portentosa*, but none of the associated fauna was described. The present author (I, p. 515) recognized the occurrence of the same horizon containing the typical echinoid amongst the fossils sent him early last year by Mr. C. P. Manglis from two localities in the vicinity of the Mitsero Mines on the north side of the Troodos Mountains, and a short list of the fossils was given, but only a few specimens were available, and from one of the localities situated 400 metres east of Agrokipia village only one specimen was collected, though fortunately that was of *Clypeaster altus*. The other locality, situated 300 metres south of Kavasi summit near Ayia Marina village, which had yielded a small fauna, was subsequently visited again by Mr. Manglis, after the special interest of it was pointed out to him, and he was successful in obtaining a considerable number of fossils which, together with the earlier collection, are here described. The rock is a rather soft yellowish or greenish sandstone, and many of the fossils are well preserved, though some only exist as casts or impressions, and therefore their identification is somewhat doubtful.

Since no detailed description of the faunas of any of the Miocene beds in Cyprus has previously been given, or any close study made of their relations to those of the neighbouring mainland or other parts of the Mediterranean area, a careful examination and comparison of the material now available has been carried out, with the aid of the large collection of fossils now available and with the help of the published works of Schaffer, Daus, Blanckenhorn, Oppenheim, and many others dealing with Asia Minor and Syria.

A general account of the distribution of the Neogene beds in Cyprus, with lists of fossils, has been given recently by the author in previous papers (1, 2, 3).

LIST OF SPECIES.

Amphistegina sp.
Echinolampas complanatus Abich.
Clypeaster altus Klein var. *alticostata* Mich.
—— —— var. *portentosa* Mich.
—— *acuminatus* Desor var. *reidi* Wright.
Ostrea sp.
Pecten kochi Locard.
—— *cristato-costatus* Sacco.
—— (*Æquipecten*) *scabrellus* Lam., var.
—— (——) *northamptoni* Micht., var.
—— (——) *bollenensis* Mayer var. nov. *cypriotes*.
—— (*Manupecten*) *fasciculatus* Millet var. nov. *manglisi*.
—— (*Flabellipecten*) *besseri* Andr.
—— (——) *costisulcatus* Alm. & Bof.
Amussium cristatum Br.
Radula sp.
Spondylus crassicosta Lam.
Arca (*Fossularca*) *lactea* L. var. *gaimardi* Payr.
Pectunculus (*Axinæa*) *deshayesi* Mayer.
    (——) *insubricus* Brocc. var. *transversa* Lam. ?
    (——) *textus* Duj.
    (——) sp.
Nuculana sp.
Cardita calyculata L.
—— (*Actinobolus*) *turonica* Iv. & Peyr.
—— (*Venericardia*) cf. *partschi* Münst.
Cardium (*Trachycardium*) *multicostatum* Brocc.
—— (*Ringicardium*) *hians* Brocc.
—— (*Lævicardium*) *taurovatum* Sacco.
—— (*Cerastoderma*) *edule* L. var. *communis* Mayer.
—— (*Discors*) cf. *aquitanicum* Mayer.

Chama gryphoides L.
—— sp.
Isocardia (*Cytherocardia*) *cytheroides* Mayer.
Venus (*Callista*) *erycina* L. var. *subtriangula* Sacco.
—— (*Circomphalus*) *haidingeri* Hoernes.
—— (*Ventricola*) cf. *tauro-alternans* Sacco.
—— (*Clausinella*) *basteroti* Desh. var. *taurorudis* Sacco.
—— (*Timoclea*) *zenonis*, sp. n.
Tapes geographicus (Chemn.).
Lucina sp.
Psammobia affinis Duj.
Corbula gibba Olivi.
—— cf. *carinata* Duj.
Clavagella cf. *brocchi* Lam.
Turbo (*Bolma*) cf. *meynardi* Micht.
Ormastralium carinatum (Bors.).
Conus (*Lithoconus*) *antiquus* Lam.
—— (*Chelyconus*) cf. *bitorosus* Font. var. *exventricosa* Sacco.
—— (*Stephanoconus*) aff. *bredai* Micht.
Solarium sp.
Natica sp.
Cassis sp.
Trochus sp.
Sigaretus ? sp.
Tuba sulcata (Pilk.), var.
Turritella sp.
Strombus cf. *coronatus* Defr.
Xenophora deshayesi Micht.

The collection is deposited in the Sedgwick Museum, Cambridge.

Echinolampas complanatus Abich.

One large example of this species, which has been described from Armenia, Egypt, and the Aleppo basin (4, p. 471, t. xvii. fig. 1), occurs in the present collection. It measures 175 mm. in diameter. The species has not been previously found in Cyprus.

Clypeaster acuminatus var. *reidi* Wright.

There is one fine specimen of a species of *Clypeaster* from the locality 300 meters south of Kavasi summit which agrees with *Cl. acuminatus* Desor var. *reidi* Wright (5, p. 124, pl. xxvi. figs. *a–f*) as revised by Cotteau (6, pp. 56, 139, pl. x. figs. 4–6), especially resembling the example figured (pl. x. fig. 4) by the last-mentioned author from the Upper Coralline Limestone of Malta. The peristome is not exposed in our specimen, but the general outline and profile, the petalodes, especially the longer unpaired one, and other characters enable us to determine the species without hesitation. Our specimen measures 50–60 mm. in height and 170–180 mm. in diameter.

Clypeaster altus Klein var. *portentosa* Michelin.

The variety of this species, which was collected by Mr. Manglis 400 metres east of Agrokipia village, is referable to the variety *portentosa* (5, p. 125, pl. xxviii. figs. *a–c*; 6, p. 149, pl. vii. figs. 1–3), which Dr. Bather recognized in Miss Bate's collection from Cape Pyla, and completely agrees with Michelin's figures and description. The species was recorded by Fischer (7, p. 308) from Cilicia in addition to the allied *C. tauricus* Desor.

Clypeaster altus Klein var. *alticostata* Michelin.

This variety (6, pl. ix. figs. 5, 7), which occurs at the principal locality for the fauna of the Clypeaster horizon in Cyprus, 300 metres south of Kavasi summit near Ayia Marina village, is scarcely separable from the above-mentioned variety *portentosa*, and the specimens from both localities were previously referred to it (1, p. 515). Daus (4, p. 470) records *Cl. altus* var. from the basin of Aleppo.

Pecten kochi Locard.

The shell, which Sacco (8, pt. xxiv. p. 62, t. xx. figs. 2–7) figures as *P. Beudanti* var. *stricticostata* Sacco from the Helvetian of Italy, is represented by one good right valve. It is allied to *P. dunkeri* Mayer and to *P. kochi* Locard, according to Sacco, but Deperet and Roman (9, p. 23, pl. ii. figs. 5, 5 *a*) consider it identical with *P. kochi*.

Our specimen possesses 14–15 equal main ribs with a group of 6–7 smaller lateral riblets at each side, occupying a space equal to about two of the main ribs. Blanckenhorn (10, p. 172) records it from various parts of Egypt in the Helvetian, and Oppenheim (11, p. 51) in the Miocene of Kaleh-Davas in Caria.

Pecten cristato-costatus Sacco.

A broken left valve with a plano-concave, nearly flat, surface (except near the beak, where it becomes slightly depressed and concave, and along the posterior edges which are slightly raised) is deserving of notice because it bears 21 straight ribs of rather unequal size, the 5th and 7th on one side and the 4th, 6th, and 8th on the other side being rather broader than the rest. The ribs are rather sharply rounded towards the periphery, but towards the beak are angular; the interspaces are rounded and as wide or rather wider than the ribs. Fine concentric striæ cross the whole shell. In spite of the slight variation in size of the ribs we may refer this specimen without hesitation to *P. cristato-costatus* Sacco (9, p. 14, pl. i. figs. 11–12 *a*) (=*acuticostatus* Sow.), which occurs in the Helvetian of Egypt (13, p. 125) as well as elsewhere in the Mediterranean and Atlantic regions.

Dimensions.—

	mm.
Length (estim.)	c. 40
Width	c. 48

Pecten (*Æquipecten*) *bollenensis* Mayer
var. nov. *cypriotes*. (Pl. IX. figs. 1–1 *c*.)

Shell transversely oval, oblique, inequilateral and inequivalve. Right valve gently convex, more so than left valve and most so in umbonal region; beak slightly swollen and incurved, rising a little above short hinge-line; umbonal angle about 120°–130°; anterior ear small, triangular, bearing 4–5 closely placed small radiating rounded riblets crossed by strong concentric lamellose striæ; posterior ear smaller, obtusely triangular; body of valve covered with 16–17 subquadrate equal and equidistant ribs, the anterior and posterior ones slightly curved, all somewhat flattened on the top and grooved down the centre proximally, but divided in their distal half or three-fourths into 3–4 narrow rounded riblets, all crossed by close concentric lineation rising into small scabrosities on crossing the riblets; on the anterior margin of the valve there are 7–8 smaller smooth riblets in place of ribs; interspaces concave, as wide as ribs, with a fine longitudinal line on each side at the base of the ribs, and crossed by fine equidistant regular concentric sharp raised lines fewer in number than those crossing the ribs, but becoming more numerous and more closely placed distally, with 1–3 weak riblets in the distal parts of most of the interspaces. Left valve shallower and flatter than right valve, with smaller lower beak; ribs and riblets as in other valve, but with more rounded tops and with interspaces having more frequently developed radial riblets.

Dimensions.—

	mm.
Height	26
Width	30

Remarks.—There is one complete specimen of this form with both valves preserved and nearly free from matrix. It seems almost inseparable from *P. bollenensis* Mayer as figured by Fontannes (23, p. 189, pl. xii. figs. 4–8), which Dollfus and Dautzenberg (14, p. 416, pl. xxxvii. figs. 8–20) only regard as a variety of their *P. seniensis* Lam. (? =*scabrellus* Lam.). But the *P. scabrellus* var. *bollenensis* figured by Schaffer (19, p. 33, t. xv. figs. 13–16) from the Miocene of Eggenburg is unlike our shell, which by the inequality of the valves, wide umbonal angle, obliquely transverse shape, and the character of the ornamentation is certainly distinct from the ordinary *P. scabrellus*, and must be regarded as a variety of *bollenensis*, which deserves to be regarded as a distinct species.

Pecten (*Æquipecten*) *scabrellus* Lamarck.

There is one perfect right valve of a species which seems to be inseparable from *P. scabrellus* and resembles the variety *plano-undulata* Sacco (8, pt. xxiv. p. 26, t. viii. fig. 12). Our specimen measures 33 mm. in height and the same in width, and has the ribbing and ornamentation beautifully preserved. Dollfus and Dautzenberg (14, p. 411, pl. xxxvii. figs. 8–30) have put *P. præscabriusculus* as a synomym of *P. scabrellus* Lam., for which species they claim that the specific name *seniensis* has the priority. It ranges from the Aquitanian to the top of the Pliocene and is common in the Helvetian, but none of the examples figured from the Miocene of the Loire by Dollfus and Dautzenberg resemble our specimen. The species *P. scabrellus* has been recorded from the Middle Tertiary of Cilicia (7, p. 271 ; 15, pp. 12, 13). Our specimen was previously (1, p. 515) recorded under the name *P. præscabriusculus* Font., and it should be observed that one of the shells from the Schio beds which Oppenheim figures (22, p. 156, t. viii. figs. 6–6 *b*, non 4) seems to be identical with it.

Pecten (*Æquipecten*) *northamptoni* Michelotti, var.

The left valve of a small specimen of this species shows the slightly oblique and inequilateral shape which is one of the characteristics of the species, and its surface bears 15–16 broad convex rounded ribs separated by rounded interspaces rather wider than the ribs ; the ribs somewhat decrease in size towards the lateral margins. At about one-third their length 5–7 fine longitudinal lines arise on the ribs, which bear numerous closely placed small equal scabrosities; the interspaces posteriorly are only crossed by fine concentric striæ, but at about one-third their length develop a similar fine longitudinal scabrous line on each side close to the base of each rib, and at half to three-fourths the length there arises a similar fine median scabrous line.

Dimensions.—

	mm.
Height (oblique)	c. 23
Width	c. 22

Remarks.—This specimen seems indistinguishable from the species *P. northamptoni* Micht., and especially resembles the variety named *multispinosa* by Sacco (8, pt. xxiv. p. 17, t. iv. fig. 7) from the Helvetian of Italy. Oppenheim has figured (22, p. 153, t. ix. fig. 4) a specimen from the Schio beds, which seems almost identical. Schaffer (16, p. 70) records *P. northamptoni* from the Miocene of Cilicia, and Oppenheim (11, p. 50) from Kaleh-Davas in Caria.

Pecten (*Manupecten*) *fasciculatus* Millet var. nov. *manglisi*. (Pl. IX. figs. 2, 2 *a*, *b*.)

There is one well-preserved left valve of a species of *Pecten* which approaches *P. fasciculatus* Millet var. *Bezieri* Dollf. & Dautz. (14, p. 425, pl. xlii. figs. 1–4) very closely, but shows slight differences in the ornamentation, which are sufficient to mark it off as another variety. In our specimen there are 9 straight low broad rounded equidistant ribs, of which those towards the lateral margins become successively rather lower and smaller; each rib bears 3–4 small riblets of which the median one is usually the largest, but towards the distal end the riblets may increase in number to 5 or 6 by intercalation or lateral addition; the shallow concave interspaces, which are rather wider than the ribs, hold 3–5 similar but smaller riblets; both ribs and riblets, which vary somewhat in development, are crossed by thin mostly equidistant imbricating lamellæ, producing small scabrosities, but the interspaces between the riblets are only minutely cancellated by longitudinal and diagonal lines of small granules.

According to Dollfus and Dautzenburg the species *P. fasciculatus* occurs in the Miocene of the Loire, in the Leitha-kalk of Austria, in Moravia, Hungary, Transylvania, Poland, in the Upper Miocene of Spain, Italy and Sardinia, and in the Pliocene of Italy, but it does not appear to have been recorded previously in Asia Minor, Syria, or Cyprus. The name of its finder may suitably be attached to this variety.

Dimensions.—

	mm.
Height	50
Width	40

Pecten (Flabellipecten) besseri Andrzejowski.

The species *Pecten besseri* Andr. (17, p. 404, t. lxiii. figs. 1–5 ; 9, p. 119, pl. xiii. figs. 2–3 *a*) and *P. incrassatus* Partsch, which are closely allied, have both been recorded from Asia Minor and Syria (15, p. 615 ; 4, pp. 482, 490, t. xvi. fig. 4), and the present author compared with the former species some specimens from the Clypeaster bed in Cyprus. The shell which was separately recorded by him as *P. subarcuatus* Tourn. is now also referred to this species.

Pecten (Flabellipecten) costisulcatus Almera & Bofill.

One example of a right valve of a species of *Pecten* with the ears partly missing must be ascribed to this species (9, p. 110, pl. xii. figs. 2, 2 *a*) because of the number of the ribs, their inequality in size, profile, size of the interspaces, and presence of 2–3 smaller lateral ribs, if we follow Deperet and Roman's diagnosis. The species typically occurs in the Mediterranean basin in the Burdigalian and Tortonian.

Amussium cristatum (Bronn).

Two large specimens of this well-known species (17, p. 419, t. lxvi. figs. 1 *a*–*d* ; 8, pt. xxiv. p. 47, t. xiii. figs. 30, 31), one measuring 90 mm. in height, occur in the collection made by Mr. Manglis. They have lost the shell from most of their surface, but show the impression of the interior surface with its numerous (20–23) straight narrow subequidistant ribs running from the umbo to the periphery, but as usual the lateral angles are smooth. The ears are well preserved and the marginal denticulations can be detected. The species has a long range from the Helvetian to the Astian inclusive, and has been recorded from the Miocene of Syria by Blanckenhorn (15, p. 27 (615); 18, p. 28 (346)) and by Fuchs (12, p. 60) long ago from the Miocene of Egypt.

Spondylus crassicosta Lamarck.

One fine large nearly entire specimen of this species and several fragments of the shells of other individuals occur in the collection. The species, which varies much in details of ornamentation, ranges from the Miocene into the Pliocene. Our specimens resemble in their oval shape and in the subgranulose or minutely scabrous radii between the large squamose ribs the variety *ornatulina* Sacco (8, pt. xxv. p 5, t. ii. fig. 30) from the Plaisancian, but the ornamentation of the specimens from the Miocene of the Loire figured by Dollfus and Dautzenberg (14, p. 452, pl. xlvi. figs. 1–4) is practically identical with ours. Fuchs (12, p. 25, t. viii. fig. 14) recorded the species from the Miocene of Egypt, and Fischer (7, p. 266) described it from Cilicia.

Arca (Fossularca) lactea Linné
var. *gaimardi* Payr.

One well-preserved left valve may be identified without hesitation with this variety (8, pt. xxv. p. 20, t. iii. figs. 24–27) of *A. lactea*, the keel and more or less flattened dorsal area, the shorter and more subquadrate shape, and the delicate radial ornamentation being well seen. It is a typical Helvetian species, and was recorded from Cilicia by Fischer (7, p. 280) many years ago. Blanckenhorn (15, p. 10 (598)) also gives it in his list of fossils from the Miocene of the Casius Mons.

Dimensions.—

	mm.
Length	18·5
Height	14·0

Pectunculus (Axinæa) deshayesi Mayer.

Large specimens of this species 85–90 mm. in height occur as internal casts. The specific name *deshayesi* is applied to this form as defined by Dollfus and Dautzenberg (14, p. 354, pl. xxxi. figs. 1–7), who include the species termed *P. pilosus* and *P. bimaculatus* by many authors.

Pectunculus (*Axinæa*) *insubricus* Brocchi var. *transversa* Lamarck ?

Several imperfect internal casts appear to be referable to this variety (8, pt. xxv. p. 35, t. ix. figs. 1–3) of *P. insubricus*, which Dollfus and Dautzenberg include in *P. cor* Lam. (14, p. 359, pl. xxxii. figs. 12–26).

Pectunculus (*Axinæa*) *textus* Dujardin.

The commonest species of *Pectunculus* in the Clypeaster bed of Cyprus is represented only by internal casts, but it seems to be referable to *P. textus* Duj. as figured and described by Dollfus and Dautzenberg (14, p. 358, pl. xxxii. figs. 1–11). It is possible that more than one species is included here under this name, but all the specimens are poor. Oppenheim (11, p. 73) records the species from the Miocene of Lycia.

Cardita calyculata Linné.

One right valve in the condition of an internal cast with the posterior end somewhat broken may be referred to this species of *Cardita*; the dorsal and ventral margins are subparallel; and the beak is low, anterior and directed forwards and downwards and does not rise above the dorsal margin; there are 16–20 ribs, of which the anterior 5–6 become smaller and curve slightly forwards. The whole shell has a transversely oblong shape. It resembles most closely *C. calyculata* L. (17, p. 274, t. 36. fig. 7) or one of its varieties. The species has been recorded by Oppenheim (11, p. 73) from the Miocene of Lycia.

Dimensions.—

	mm.
Height	17
Length	25

Cardita (*Actinobolus*) *turonica* Ivolas & Peyrot.

This species, which occurs typically in the Miocene of the Loire (14, p. 289, pl. xxii. figs. 8–15), is represented by several internal casts and imperfect external impressions, and according to Dollfus and Dautzenberg is the same as *Actinobolus antiquatus* Linn. var. *affinis* Duj. of Sacco (8, pt. xxvii. p. 19, pl. v. figs. 17–19).

Cardita (*Venericardia*) cf. *partschi* Münster.

There are several internal casts of a species of *Cardita* which come closer to *C. partschi* Münst. (17, p. 270, t. 36. figs. 3 *a–d* ; 19, p. 61, t. xxviii. figs. 13–15) than to any other species, in shape and ribbing. *C. partschi* is a typical Miocene species.

Cardium (*Trachycardium*) *multicostatum* Brocchi, var.

In the typical form of this species (14, p. 316, pl. xxv. figs. 31–38) the shell is more or less oblique, but Sacco (8, pt. xxvii. p. 42, t. xxvii. figs. 7–10) describes a variety as *miorotundata* from Turin, which closely approaches the form which occurs in the Clypeaster bed of Cyprus in having no obliquity but a rounded subquadrate shape and a nearly central beak. In fact, it agrees much better with the example of this species from the Miocene of Eggenburg figured by Schaffer (19, p. 65, text-fig. 7). Fischer (7, p. 285) records the species from the Middle Tertiary of Cilicia. Our specimens have a more elevated and more acute umbo than in the type, rising higher above the hinge-line ; there are 60–65 ribs on the surface and those on the posterior third of the valves are decidedly broader than those on the rest of the valve, and the posterior slope has a slight flattening or even excavation. The bases of the little spines on the ribs are here and there preserved.

Dimensions.—

	mm.
Height	35
Width	35

Cardium (*Ringicardium*) *hians* Brocchi.

The impression of part of the exterior of a valve referable to this species (17, p. 181, t. 26. figs. 1–5) shows the broad somewhat flattened interspaces crossed by fine transverse striæ, and having a narrow radial line close to the base of each of the very narrow prominent ribs, which are only about one-fifth or one-sixth the width of the interspaces, and bear a series of equidistant small sharp scabrosities along their summit. In our fragment there are four interspaces in a transverse distance of 13 mm. on the edge of the valve.

Cardium (*Lævicardium*) *taurovatum* Sacco.

One good internal cast may be referred to this species (8, pt. xxvii. p. 53, t. xii. figs. 6 *a*, *b*), for it shows the typical characters, dentition, and minute marginal denticulation.

Cardium (*Cerastoderma*) *edule* Linné var. *commune* Mayer.

This long-ranging and variable species is figured and described by Schaffer (19, p. 62, t. xxix. figs. 1–5) from the Miocene of Eggenburg, and this variety is represented in the collection made by Mr. Manglis.

Cardium (*Discors*) cf. *aquitanicum* Mayer.

There is one imperfect cast of the left valve of a shell about 35 mm. in height, which may be compared with *Cardium* (*Discors*) *aquitanicum* Mayer (14, p. 332, pl. xxvii. figs. 11, 12), for it shows similar radial striation, a few thin concentric laminæ or lines, and an oval shape, as described and figured by Dollfus and Dautzenberg. The species ranges from the Oligocene to the Pliocene. Hoernes (17, p. 175, t. 24. figs. 6, 7) considered *C. aquitanicum* to be identical with *C. pectinatum* L., which occurs in Rhodes, but this is not generally admitted.

Chama gryphoides Linné.

There is one large, moderately convex, subcircular valve of a species of *Chama* referable to *Ch. gryphoides* as figured by Hoernes (17, p. 210, t. 31. fig. 1). It is not quite perfect and has the external surface somewhat destroyed, but it shows the strongly enrolled beak turned to the left, and a well-marked groove on the dorsal slopes concentric to the dorsal and posterior margins running from the beak down to the posterior corner; there seems to be also a much weaker broad depression curving forwards and across the surface to the middle of the inferior margin. Widely but irregularly spaced thin concentric foliose laminæ cross the surface, but there are no distinct signs of any crinkling of their edges or of the presence of radial striæ. The internal cast of a much larger specimen with both valves in position shows the muscle-scars and cardinal region with great distinctness.

Dimensions.—

	mm.
Height	85
Width	c. 85

Verticordia sp.

There is one internal cast of a nearly perfect left valve which seems to be referable to the genus *Verticordia*; the ornamentation of part of the surface is also shown as an impression on the matrix which surrounds the dorsal and umbonal region. The shell has a high rounded subtriangular shape, the anterior end projects somewhat below the depressed pseudo lunular area, the ventral margin is strongly arched passing up behind into the broadly arched descending dorsal edge; the beak is high, incurved, subanterior, prosocœlous, partly enrolled, and directed forwards and downwards; there is an interior submarginal rounded thickening of the valve, having the ribs strongly marked on the edge, a subcircular muscle-scar is present close to the thickening at the antero-ventral angle; the hinge has the peculiar characters of *Verticordia,* so far as can be seen; the impression of the surface of the valve shows rather coarse, regular, sharply rounded, radial costæ of equal size curving forward from the beak to the margin and separated by narrower or subequal angular or subangular interspaces, all crossed by concentric striæ. This shell seems more to resemble *Verticordia* (*Haliris*) *jamaicensis* Dall, from the Bowden beds of Jamaica (21, p. 93, pl. xi. figs. 9–11), than the European species *V. acuticostata* Phil. figured by Sacco (8, pt. xxix. p. 130, t. xxix. figs. 21, 22).

Dimensions.—

	mm.
Height	23
Length	c. 20

Isocardia (*Cytherocardia*) *cytheroides* Mayer.

There is one well-preserved left valve referable to this species which Sacco (8, pt. xxviii. p. 5, t. 1. figs. 7–11) describes and figures from the Helvetian of Turin. The surface-ornamentation is beautifully preserved in our specimen, which measures 18 mm. in length and 13 mm. in height.

Venus (*Callista*) *erycina* Linné var. *subtriangula* Sacco.

One right valve of this species occurs in the collection, having the shape of the variety *subtriangula* Sacco (8, pt. xxviii. p. 17, t. iii. figs. 12, 13) of the Helvetian of Italy and Miocene of Eggenburg (19, p. 78, t. xxxvi. figs. 6–9), which is considered to approach some varieties of *C. pedemontana* Ag. (=*Meretrix italica* Defr., *fide* Dollf. & Dautz.). It shows the dentition and the thick low concentric flattened equal rugæ on the surface, but the shell seems less convex and more compressed than in Sacco's examples.

Dimensions.—

	mm.
Height	26
Width	33

Venus (*Circomphalus*) *haidingeri* Hoernes.

There is one imperfect right valve which may without much doubt be ascribed to *V. haidingeri* Hoernes (17, p. 134, t. xv. figs. 7 *a–d*; 19, p. 85, t. xl. figs. 2–4), a species occurring in the Miocene of the Vienna basin and elsewhere.

Venus (*Ventricola*) cf. *tauro-alternans* Sacco.

A large robust right valve agrees better with Sacco's description and figures of *Ventricola tauro-alternans* (8, pt. xxviii. p. 33, t. viii. figs. 32–34) than with *V. alternans* Bonelli, in shape, convexity, and high broad subcentral umbo. But the concentric ornamentation of imbricating lamellæ and striæ is more regular and uniform as in *V. burdigalensis* Mayer (17, p. 129, t. 15. figs. 1 *a*, *b*). Probably it is only a variety of Sacco's species. The minute denticulation of the margin is clearly seen, showing it belongs to the genus *Venus*, though the dentition is not exposed, and we may, therefore, hesitate to identity it.

Venus (*Clausinella*) *basteroti* Deshayes var. *tauro-rudis* Sacco.

This Miocene species is represented by one right valve, which agrees with the Helvetian variety *tauro-rudis*

Sacco (8, pt. xxviii. p. 42, t. ix. figs. 56, 57). It measures 17 mm. in height.

Venus (*Timoclea*) *zenonis*, sp. n.
(Pl. IX. fig. 3.)

Shell small, rounded-subquadrate, the dorsal and posterior margins forming a continuous curve to posterior ventral angle; ventral margin very gently curved, but arching up steeply in front to pass into broadly rounded anterior end; beak subcentral, small, pointed, slightly directed forwards, with very gently arched preumbonal margin passing into broadly rounded anterior end of shell; surface of valve moderately convex, most so along a weak but distinct gently arched umbonal ridge, above which the posterior dorsal surface is somewhat flattened. Ribs about 40 in number, closely placed, low, broad, flattened, very slightly convex, straight, mostly simple, only two or three of the anterior ones being divided at their ends by a fine median line; the 10–12 ribs on the posterior slope are rather smaller than the rest, and the anterior 7–9 are very slightly curved forwards, interspaces very narrow, deep; both ribs and interspaces beaded, being crossed by thick concentric closely placed equidistant lines, which thicken on the ribs and produce in the interspaces between them a moniliform series of pits. Dentition incompletely known, but a long narrow curved anterior lateral tooth is present in right valve.

Dimensions.—

	mm.
Length	6·25
Height	6·00

Remarks.—This species is based on a cast, and impression of a complete right valve in a good state of preservation. It is allied to *V.* (*T.*) *ovata* Penn. (14, p. 207, pl. xi. figs. 40–47).

Tapes geographicus (Chemnitz).

There is one perfect right valve of this species (14, p. 179, pl. xiv. figs. 31–33) showing two strong submarginal concentric growth-ridges and a fine close regular concentric lineation of the surface, with only very faint traces on the posterior part of very delicate radial striæ.

The posterior end is more sharply rounded than in the variety *pullastra*, but otherwise the characters agree.

Dimensions.—

	mm.
Height	22
Length	35

Psammobia affinis Dujardin.

A broken internal cast with the greater part of the left valve preserved allows us to identify this species (8, pt. xxix. p. 8, t. 1. figs. 29–42), which Dollfus and Dautzenberg (14, p. 157, pl. ix. figs. 1–7) consider a synonym of *Tellina uniradiata* Brocchi. There are several varieties, but ours agrees with the Helvetian form, in which the radial riblet on the posterior region is weak.

Corbula cf. *carinata* Dujardin.

One small right valve of a much inflated carinated species of *Corbula* is unusually short for *C. carinata* Duj., but otherwise it resembles some of the specimens figured under that name by Dollfus and Dautzenberg (14, p. 80, pl. iii. figs. 1–14).

Corbula gibba Olivi.

There is one right valve of this species, which contains many varieties, but our specimen has the typical shape (8, pt. xxix. p. 39, t. ix. figs. 1–4).

Dimensions.—

	mm.
Height	9·5
Length	14·0

Turbo (*Bolma*) cf. *meynardi* Michelotti.

Some imperfect internal casts of a species of *Turbo* seem to be more like *T.* (*B.*) *meynardi* Micht. (8, pt. xxi. p. 11, t. 1. fig. 23) than *T.* (*B.*) *rugosa* Linn., though these two species are closely allied.

Ormastralium carinatum (Borson).

The internal cast of the greater part of the shell (8, pt. xxi. pp. 17, 18, t. ii. figs. 15, 16, *non cet.*) may be referred without much hesitation to this Helvetian species, or to one of its varieties with a low conical apex, for it possesses the shape and ornamentation of those whorls which are preserved.

Conus (*Lithoconus*) *antiquus* Lamarck.

There is one internal cast of a large species of *Conus* with a diameter at the base of the spire of 60–65 mm., and an estimated length of about 120–130 mm., which shows the excavated edges of the whorls on the apical surface of the low conical spire, the slightly rounded shoulders, and other characters of *C. antiquus* Lam. (8, pt. xiii. pp. 23–26, t. iii. figs. 6–15) or one of its varieties from the Helvetian of Turin. Oppenheim (11, p. 111) records the species from the Miocene of Lycia.

Conus (*Chelyconus*) cf. *bitorosus* Fontannes var. *exventricosa* Sacco.

A small but perfect cast of a species of *Conus* measuring 30 mm. in length, with a low conical spire of which all the whorls except the outer one are rounded on the apical surface and not excavated was at first compared with *C. avellana* (Lam.), especially with the variety *pseudoplanata* Sacco (8, pt. xiii. p. 102, t. ix. fig. 63) of the Helvetian. The outer whorl has a sharp apical edge with a sunken suture, while the edges of the other whorls in the spire are convex. The diameter of the shell at the base of the spire is 18 mm., so that the rate of tapering to the pointed end of the shell is rapid, and its general shape and characters are more like *C. bitorosus* Font. var. *exventricosa* Sacco, as described and figured by Schaffer (19 *a*, p. 133, t. ii. figs. 4–6) from the Miocene of Eggenburg.

Conus (*Stephanoconus*) aff. *bredai* Michelotti.

A few low, broad, rounded, tubercular swellings are visible round the apical edge of the outer whorl of a specimen of *Conus*, indicating its reference to *Stephanoconus*, but it is somewhat distorted and crushed, so that the shell does not seem to be regularly conical and the sides seem to be slightly convex instead of flat. There are only 4–5 whorls, and the first two are deep; the shoulders of the outer one are well rounded; the spire is low, obtusely pointed, and rises rather suddenly in the middle to the apex. There are traces of punctæ on the sides of the outer whorl. Some of the varieties of

C. (*St.*) *bredai* Micht. (8, pt. xiii. p. 118, t. xi. figs. 17–20) seem to resemble it.

Strombus cf. *coronatus* Defrance.

The internal cast of the outer whorl of a large species of *Strombus*, resembling some examples of *Str. coronatus* Defr., shows a few very faint low swellings along the upper edge of the whorl and traces of another row at about one-fourth the height from the base. *Str. coronatus* is recorded by Daus (4, p. 459) from the Miocene of Cilicia and by Blanckenhorn from Egypt and Syria. Gregory (20, p. 626, pl. xliii. fig. 14) figures a cast from the Helvetian-Tortonian of Cyrenaica as *Str.* cf. *coronatus*, which much resembles our specimen.

Tuba sulcata (Pilkington), var.

One small example of this species, resembling the variety named *pedemontana* by Sacco (8, pt. xix. p. 38, t. iii. fig. 45), occurs in the collection showing the characteristic shape and concentric rounded cingulæ.

Xenophora deshayesi Michelotti.

The internal cast of a large species of *Xenophora* shows the base and three whorls (the apex is broken off) of a low conical shell with an apical angle of apparently about 90°, but the specimen is somewhat distorted and crushed. The basal margin is simple. The basal and next succeeding whorl occupy fully three-fourths the height of the shell, and their surface is covered with shallow circular pits, apparently arranged in curved radial lines and probably corresponding to a coarse cancellation on the shell. We may refer this specimen to *X. deshayesi* Micht. (8, pt. xx. p. 20, t. 1. fig. 20), which occurs in the Helvetian, and is recorded by Fischer (7, p. 249) from Cilicia and by Blanckenhorn (15, p. 597) from 10 km. north of Antioch.

CONCLUSIONS.

From the composition of the above-described fauna we are led to observe the close relations which it has with that of the Miocene of Cilicia and of the neighbouring parts of Asia Minor and Syria. Such was to be expected from the general tectonic relations of Cyprus to the mainland. The occurrence of many Miocene species widely spread throughout the Mediterranean region is also noticeable, and there is an almost complete absence of any recognizable new species or varieties. We may also remark that few of the specially Egyptian Miocene forms occur, and the Miocene fauna of Italy and of the Vienna basin is only represented by a few species, though these have mostly a wide geographical range.

The precise position of the Clypeaster bed in the Miocene series of Cyprus remains to be determined by stratigraphical evidence, but the fauna clearly indicates that it is referable to the Helvetian.

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EXPLANATION OF PLATE IX.

Fig. 1. *Pecten* (*Æquipecten*) *bollenensis* Mayer var. nov. *cypriotes.* Left valve of complete specimen. × 1⅓.
Fig. 1 *a.* Ditto. Right valve of same specimen. × 1⅓.
Fig. 1 *b.* Ditto. Anterior marginal view of same specimen. × 1⅓.
Fig. 1 *c.* Ditto. Portion of surface of right valve. × 3.
Fig. 2. *Pecten* (*Manupecten*) *fasciculatus* Millet var. nov. *manglisi.* Left valve. × 1⅓.
Fig. 2 *a.* Ditto. Portion of valve near umbo. × 8.
Fig. 2 *b.* Ditto. Portion of distal two-thirds of valve. × 3.
Fig. 3. *Venus* (*Timoclea*) *zenonis*, sp. n. Right valve (from squeeze). × 6.

XXVII.—*On a Collection of Polychæta from Dry Tortugas, Florida.* By C. C. A. Monro, British Museum (Natural History).

Introduction.

This collection was made by J. S. Colman and G. Tandy, and forms part of their material for an ecological survey of the Long Bush Key, Dry Tortugas. The numbers in the locality lists under the specific headings refer to various points in this survey, a detailed account of which is being prepared for publication by the Carnegie Institute of Washington.

The Polychæta of the West Indian region have been fairly extensively studied. Horst, in 1922, compiled an uncritical list of the species recorded from the West Indies, which I believe to be complete for that date but for the omission of those recorded in Webster's (1884) and Verrill's (1900) papers on the Bermudan Polychætes, in Benedict's (1887) on the 'Albatross' (1883–85) collections, and in Treadwell's (1921) monograph on the Eunicidæ of the West Indies.

Since Horst's list there have been three important papers on the Polychætes of this area by Augener. The first of these (1922) deals with the collection made by Kükenthal and Hartmeyer, the second (1925) is a revision of the West Indian types of Grube (Oersted), Kröyer, Mörch, and Schmarda, and the third (1927) is an account of the annelids collected by Horst at Curaçao.

The present collection has enabled me to add several new records to the Polychæte fauna of the West Indian region. These are *Sigalion mathildæ* Audouin & M.-Edwards, *Chrysopetalum debile* Grube, *Lumbrinereis heteropoda* Marenzeller, *Arabella novecrinita* Crossland, *Ctenodrilus serratus* (O. Schmidt), and *Protula tubularia* (Montagu). I have established a new genus of Ariciidæ—*Haploscoloplos*—to contain *Scoloplos cylindrifer* Ehlers and *tortugaensis*, sp. n., mihi. I have also described a new variety of Lumbrinereid, *Lumbrinereis floridana* Ehlers, var. *polygnatha*, var. nov.

Family **Amphinomidæ.**

Eurythoë complanata (Pallas).

Eurythoë alcyonia Gravier, 1901, pp. 248–254, pl. ix. figs. 140–143 pl. x. figs. 144–146, text-figs. 257–268.
Eurythoë complanata, Augener, 1927, p. 41.

Occurrence.—Dry Tortugas, 35 (2); 89 (1); 259 (2) juv.; 305 (8); 341 (1); 54 (5 juv.).

Hermodice caruncula Pallas.

Fauvel, 1923, p. 130, fig. 47, *a–h*; Augener, 1927, p. 41.

Occurrence.—Dry Tortugas, 47 (1); 341 (1).

Amphinome rostrata (Pallas).

Amphinome pallasii Fauvel, 1923, p. 127, fig. 46, *a–g*.

Occurrence.—Dry Tortugas, 328 (2).

Remarks.—These are young specimens, the larger measuring only 7 mm. by 1 mm. for about 20 chætigers.

Family **Aphroditidæ.**

Aphrodite obtecta Ehlers.

Ehlers, 1887, p. 42, pl. vi. figs. 1–8.

Occurrence.—Dry Tortugas, 284 (1).

Remarks.—This specimen measures 40 mm. by 23 mm., including the feet, at the widest part for about 35 chætigers. The back is an almost impenetrable mass of hairs and grey mud, which completely conceals the dorsal bristles. The outline of the body, as revealed by examining the ventral surface, is more like that of *A. acuminata*, for it tapers posteriorly, but the dorsal felting and the ventral bristles resemble those of *A. obtecta*.

Family **Sigalionidæ.**

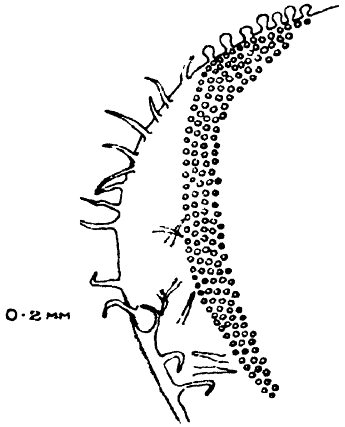
Sthenelais boa (Johnston). (Fig. 1.)

Fauvel, 1923, p. 110, fig. 41, *a–l*; Augener, 1927, p. 42.

Occurrence.—Dry Tortugas, 347 (1).

Remarks.—Two fragments measuring 3 mm. in breadth including the feet. They are conspecific with the specimen from Curaçao attributed by Augener to this species. In addition to the filiform papillæ on the edge of the elytra there are a number of clavate papillæ (fig. 1). In this the West Indian form differs from the European I can see no other distinguishing character.

Fig. 1.



Sthenelais boa (Johnston).
Part of scale showing fringe and clavate papillæ.

Sigalion mathildæ Audouin & M.-Edwards.

Fauvel, 1923, p. 103, fig. 39, *a–l*.

Occurrence.—Dry Tortugas, 347 (1).

Remarks.—A single anterior fragment measuring 3 mm. in breadth including the feet. I have compared it with a specimen of this species from St. Vaast, and in my opinion they are conspecific. The *Sigalion pourtalesii* of Ehlers has a different notopodium and different bristles. The *S. edwardsi* of Kinberg (1857), from off La Plata, appears to be very near, but there is no bristle similar to that figured by him in his pl. ix. fig. 41, U.

This is the first record of *S. mathildæ* from the West Indies.

Family **Chrysopetalidæ.**

Chrysopetalum debile Grube.

Fauvel, 1923, p. 122, fig. 44, *r–u*.

Occurrence.—Dry Tortugas, 259 (1) ; 277 (1).

Remarks.—I have compared these specimens with one from the Panama region of the Pacific coast, and I find them conspecific, and in my opinion *Ch. occidentale* Johnson is a synonym of this species. *Ch. elegans* Bush, from the Bermudas, probably belongs here also.

Family **Phyllodocidæ.**

Phyllodoce (Anaitides) oculata Ehlers.

Ehlers, 1887, p. 135, pl. xl. figs. 4–6.

Occurrence.—Dry Tortugas 369 (1).

Remarks.—Augener claims that this species is a synonym of *P. erythrophylla* Schmarda. *Phyllodoce tortugæ* Treadwell also probably belongs here.

Family **Syllidæ.**

Syllis (Haplosyllis) spongicola Grube.

Fauvel, 1923, p. 257, fig. 95, *a–d*.

Occurrence.—Dry Tortugas, 126 (numerous) ; 321 (1).

Syllis prolifera Krohn.

Fauvel, 1923, p. 261, fig. 97, *a–g*.

Occurrence.—Dry Tortugas, 52 (1) ; 277 (8).

Syllis tigrinoides Augener. (Figs. 2 *a, b, & c.*)

Augener, 1922, p. 43, and 1927, p. 52.

Occurrence.—Dry Tortugas, 89 (6).

Remarks.—These specimens measure about 25 mm. by 1 mm. In the anterior region the body is slightly arched dorsally, but in the middle, and especially in the hinder regions, it is markedly flattened. Anteriorly the back shows traces of brown pigment, and between the segments there are bands consisting of two thin transverse stripes inclosing a wider white stripe.

The head (fig. 2 *a*) is rounded and broader than long. In some examples, but not in all, two pairs of orange eyes are evident, set in a more or less straight line across

Fig. 2 *a*.

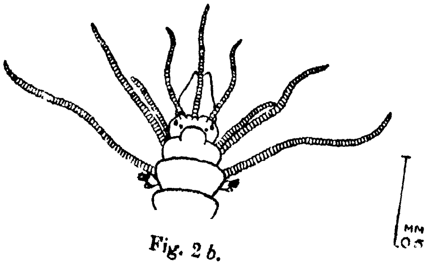


Fig. 2 *b*.

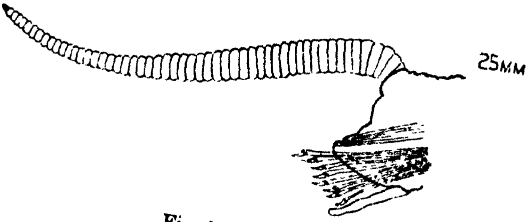
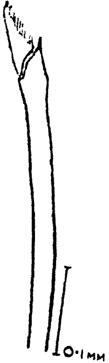


Fig. 2 *c*.



Syllis tigrinoides **Augener.**

Fig. 2 *a*.—Head.
Fig. 2 *b*.—Middle foot.
Fig. 2 *c*.—Bristle from middle foot.

the head. Of these the outer pair is considerably the larger. The palps are about as long as the head is broad. There is a nuchal flap reaching almost to the base of the median tentacle.

The pharynx, extending from the 1st to the 13th chætiger, and proventriculus are both long, as Augener indicates, and the tooth set far forward. The proventriculus ends at about the 21st chætiger, and the tooth lies in the 2nd. The inequality of the dorsal cirri is striking, for over most of the body the longer cirri are about twice as long as the shorter. I cannot make an accurate count of the number of articles, because I find that while at the ends of the cirri the limits of the articles are plain, in the middle for a short distance they are impossible to separate. Augener gives 65 and 39 as the number of articles for the longer and shorter cirri at about the 50th foot. My impression is that in these specimens the number is considerably less; I should put it at about 45 and 25.

In profile the feet (fig. 2 *b*) are triangular and consist of an anterior and posterior lip. There is a slender, filiform, ventral cirrus, long enough to reach to the head of the ventralmost bristle in the foot. Dorsally there are two or three acicula, and the bristles (fig. 2 *c*) are bidentate, with rather short and broad blades. I see no simple bristles in the posterior region.

These specimens come from the type-locality of Augener's species, and, although very close to *S. variegata*, the species is, I believe, distinct.

Syllis variegata Grube.

Fauvel, 1923, p. 262, fig. 97, *h–n*.

Occurrence.—Dry Tortugas, 63 (3).

Syllis corallicola Verrill. (Figs. 3 *a* & *b*.)

Verrill, 1900, p. 603.

Occurrence.—Dry Tortugas, 54 (1); 321 (2).

Remarks.—These specimens measure about 20 mm. by 1 mm. The head agrees with Verrill's account. The pharynx extends to the 14th chætiger and the proventriculus to the 21st. In this my specimens differ from Verrill's, for he states that the proventriculus is about one-third longer than the pharynx. The tooth lies just behind the mouth of the pharynx.

The dorsal cirri are very long and in the middle of the body have alternately between 60 and 70 and between 30 and 40 articles. The characteristic feature of this species is the very long and slender blades of the bristles in the anterior region (fig. 3 *a*). In the middle and posterior regions these blades are broader and shorter, and while all the bristles are bidentate, the second tooth is much more easily seen in the shorter and broader blades (fig. 3 *b*). So far as I know, this species has never been figured.

Fig. 3 *a*.

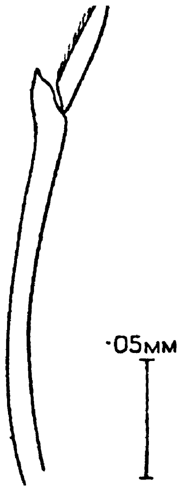
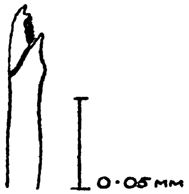


Fig. 3 *b*.



Syllis corallicola Verrill.

Fig. 3 *a*.—Bristle from anterior region.
Fig. 3 *b*.—Bristle from middle region.

Syllis fuscosuturata Augener. (Figs. 4 *a*, *b*, & *c*.)

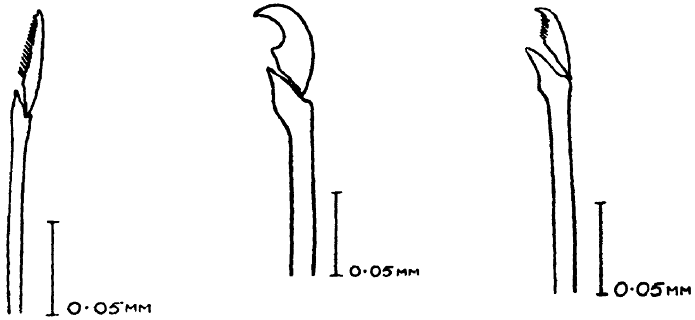
Augener, 1922, p. 43, and 1927, p. 52.

Occurrence.—Dry Tortugas, 321 (1).

Remarks.—The specimen measures about 10 mm. in length. The colour has disappeared. The head corresponds to Augener's account, except that I see only two pairs of eyes and not three ; these two pairs are set more or less side by side. The tooth lies at the very end of the pharynx, which extends to the 8th chætiger ; the proventriculus ends at the 18th. The dorsal cirri have alternately about 30 and 40 articles.

For the first few chætigers the bristles have narrow bidentate blades (fig. 4 *a*), the upper ones being more elongate than the lower. More posteriorly two or three bristles, with rather broad unidentate blades, appear at the base of the bristle-bundle. From before backwards these unidentate bristles change their character and become sickle-shaped structures (fig. 4 *b*), which in the hinder region are of relatively great size. At the same time the bidentate bristles lose their second tooth and become shorter and broader (fig. 4 *c*), and the heads of the shafts become expanded and resemble those of *Syllis krohnii*.

Fig. 4 *a* Fig. 4 *b*. Fig. 4 *c*.



Syllis fuscosuturata Augener.

Fig. 4 *a*.—Bristle from anterior region.
Fig. 4 *b*.—Posterior hook.
Fig. 4 *c*.—Bristle from middle region.

The characteristic feature of this species is the large sickle-shaped hooks in the middle and hinder regions. This species shows affinities with both *S. krohnii* and *S. exilis*. I rather suspect that *S. fuscosuturata* is the same as *S. annularis* Verrill.

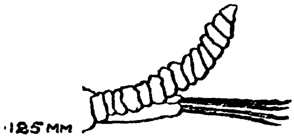
Syllis tortugaensis Augener. (Fig. 5.)

Augener, 1922, p. 43, and 1927, p. 51.

Occurrence.—Dry Tortugas, 321 (1).

Remarks.—This specimen measures about 14 mm. in length. The material is unsuitable for studying the head. The median tentacle has 12 articles. The pharynx is everted and reaches back to the 9th chætiger; its mouth is furnished with papillæ, whose number appears to be four, but of this I am not certain. The tooth lies at the end of the pharynx. The proventriculus extends to the 18th chætiger. The tentacles and cirri have a characteristic appearance; they are stout, and the very deep constrictions give them a very uneven outline (fig. 5). The individual articles are often wide and plate-shaped. In the middle of the body the dorsal cirri have alternately about 18 and 15 articles. There is nothing characteristic about the bristles, which have rather short bidentate blades.

Fig. 5.



Syllis tortugaensis Augener.
Middle foot from above.

Syllis cincinnata Verrill. (Figs. 6 *a*, *b*, *c*, *d*, & *e*.)

Verrill, 1900, p. 609.

Occurrence.—Dry Tortugas, 369 (2).

Remarks.—These specimens measure about 20 mm. in length. The head (fig. 6 *a*) is more or less rectangular in shape, twice as broad as long, and bears two pairs of orange-coloured eyes, of which the kidney-shaped outer and anterior pair is the larger. The palps are about half the length of the median tentacle. The latter has about 25 articles and the lateral tentacles have about 18 articles. The dorsal tentacular cirri are about equal in length to the median tentacle. The dorsal cirri of about the first ten chætigers (fig. 6 *b*) are long and slender and have alternately about 40 and 25 articles. They rapidly decrease in length from before backwards, and at the 20th chætiger have alternately about 30 and 15 articles. This decrease in length of the dorsal cirri continues to the hinder end, where they have alternately about 15 and 10 articles (fig. 6 *c*). In the hinder region they are spindle-shaped and have a very different appearance from those of the front segments. A similar change takes place in the ventral cirri, which in the front region are digitiform and reach about halfway up the bristles. Posteriorly they are short and conical, but owing to a parallel reduction in the length of the bristles their length relatively to the bristles is about the same.

Fig. 6 *a*.

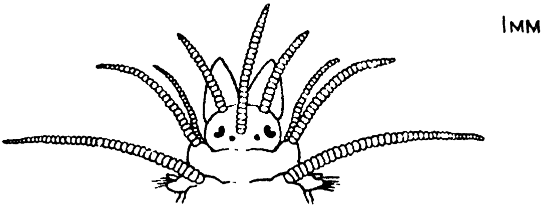


Fig. 6 *b*.

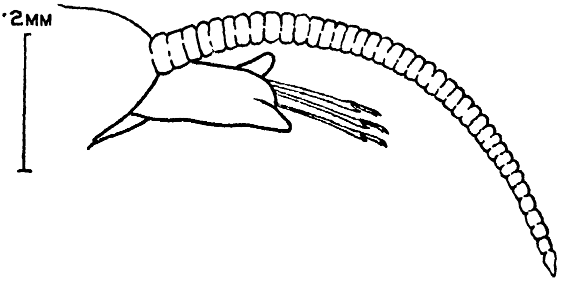
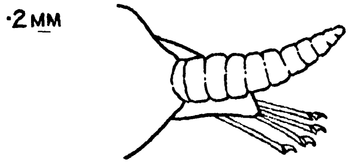


Fig. 6 *d*.

Fig. 6 *e*.

Fig. 6 *c*.



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Syllis cincinnata Verrill.

Fig. 6 *a*.—Head.
Fig. 6 *b*.—Anterior foot seen from above.
Fig. 6 *c*.—Posterior foot seen from above.
Fig 6 *d*.—Bristle from anterior region.
Fig. 6 *e*.—Bristle from posterior region.

The pharynx extends to the 13th chætiger and the proventriculus to the 26th. The tooth lies at the front end of the pharynx.

The bristles in the front segments are long, with slender and elongate bidentate blades (fig. 6 *d*). These give place to shorter and broader bristles with unidentate ends (fig. 6, *e*). This shortening and broadening of the bristles continues to the hinder end, where the blades are much reduced. There are 2 or 3 acicula.

So far as I know, this species has not been recorded since its original description by Verrill, and I know no other *Syllis* which shows similar differences in the cirri of the front and hinder regions.

Opisthosyllis nuchalis Verrill. (Figs. 7 *a*, *b*, & *c*.)

Verrill, 1900, p. 620.

Occurrence.—Dry Tortugas, 277 (6); 259 (numerous).

Remarks.—These specimens measure about 9 mm. by 1 mm. without the feet. The body is, especially in the anterior region, very strongly arched dorsally and flattened ventrally. There is no colour except for the brown pharynx, which can be seen by transparency through the body-wall; in this this species differs from the closely allied *O. brunnea* Langerhans, which Augener has recorded from the West Indies. The prostomium (fig. 7 *a*) is broader than long and is divided into two rounded lobes. There are two pairs of small red eyes; the posterior pair is situated a little inside and behind the anterior pair in such a way that the eyes are arranged in a slightly concave line and not in a trapeze or rectangle. The palps are longer than the prostomium and divergent. The median tentacle is about twice as long as the palps and the laterals are about two-thirds of this. There is a very large occipital flap or gibbosity which covers the hinder end of the head as far as the base of the median tentacle. The dorsal tentacular cirrus is about equal in length to the median tentacle, and the ventral is slightly shorter. The dorsal cirrus of the first chætiger is about twice as long as the lateral tentacles.

The pharynx extends to about the 9th chætiger and the tooth lies in about the 8th. This is a curious bluntly conical structure arising from a rounded chitinous base. The proventriculus extends from about the 9th to the 18th chætiger.

Both tentacles and dorsal cirri are moniliform, and in the middle of the body the dorsal cirri have alternately about 30 and 20 articles. These articles are narrow and cylindrical rather than rounded.

Fig. 7 *a*.

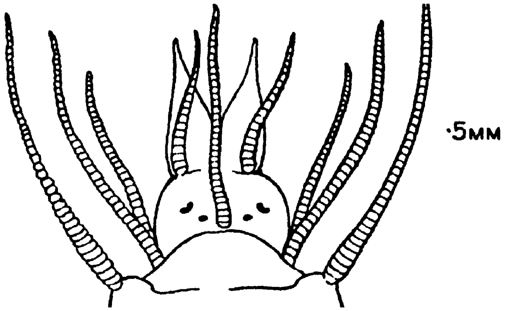


Fig. 7 *b*.

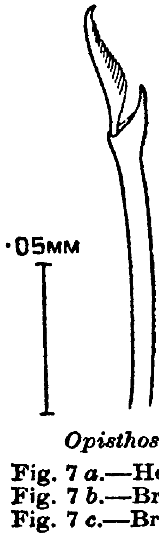
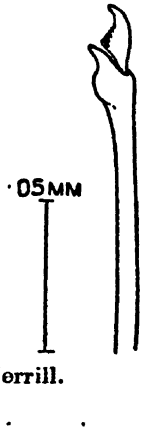


Fig. 7 *c*.



Opisthosyllis nuchalis Verrill.

Fig. 7 *a*.—Head.
Fig. 7 *b*.—Bristle from anterior region.
Fig. 7 *c*.—Bristle from posterior region.

The bristles are unidentate. In the anterior region (fig. 7 *b*) they show nothing unusual, but further back the blades become shorter and broader (fig. 7 *c*), and the head of the shaft becomes enlarged just below the articulation in a manner that strongly recalls that in *Syllis exilis* Gravier (*v.* Fauvel, 1917, p. 197, text-fig. xi.). In the hinder region a single, rather stout simple bristle appears in each foot. There is a pair of long anal cirri.

It is doubtful whether this species is more than a colourless variety of Langerhans's *O. brunnea*.

Family **Nereidæ**.

Ceratonereis versipedata (Ehlers).

Nereis versipedata Ehlers, 1887, p. 116, pl. xxxvi. figs. 5–10.

Occurrence.—Dry Tortugas, 369 (numerous).

Remarks.—In Ehlers's figure 7 the notopodial aciculum should lie above the lower notopodial lamella instead of within it.

There appears to be considerable variation in the extent to which the hinder lip of the notopodial chæta-sac is developed to form a middle dorsal lamella. In the present specimens it is well developed and corresponds to Ehlers's figures, but in two small examples from Colón, measuring about 1 mm. across the body without the feet, recently examined by me, this middle dorsal lamella was scarcely developed at all.

Ceratonereis tentaculata (Kinberg).

Horst, 1924, p. 180, pl. xxxv. figs. 4–7.
Nereis mirabilis Augener, 1927, p. 48.

Occurrence.—Dry Tortugas, 259 (1).

Perinereis floridana (Ehlers).

Nereis floridana Ehlers, 1868, p. 503.

Occurrence.—Dry Tortugas, 421 (3) ; 424 (3).

Remarks.—Fauvel treats this species as a form of *P. cultrifera*, from which it differs in having a single paragnath in Group V. instead of three in a triangle. Moreover, my impression is that the dorsal cirri arise relatively further back on the feet.

Nereis riisei Grube.

Augener, 1927, p. 47.

Occurrence.—Dry Tortugas, 89 (1).

Platynereis dumerilii (Audouin & M.-Edwards).

Fauvel, 1923, p. 359, fig. 141, *a–f*.

Occurrence.—Dry Tortugas, 242 (10) ; 60 (1) ; 392 (3).

Family **Eunicidæ.**

Eunice rubra Grube.

Ehlers, 1887, p. 87, pl. xxvi. figs. 1–11.

Occurrence.—Dry Tortugas, 369 (2).

Eunice mutilata Webster.

Webster, 1884, p. 315, pl. ix. figs. 36–40.
Leodice mutilata Treadwell, 1921, p. 30, pl. iii. figs. 5–8, text-figs 66–76.

Occurrence.—Dry Tortagas, 48 (1).

Eunice macrobranchia Schmarda.

Augener, 1927, p. 56, with synonymy.

Occurrence.—Dry Tortugas, 382 (1).

Remarks.—The characteristic dark striping is clearly evident. Augener makes *E. rousseaui* Quatrefages a synonym of this species. In my opinion *E. rousseaui* is identical not with this species but with *E. aphroditois* Savigny.

Eunice cariboa Grube.

Leodice culebra Treadwell, 1921, p. 49, pl. ii. figs. 13–16, text-figs. 144–153.
Eunice gagzoi Augener, 1922, p. 45, and 1927, p. 60, fig. 4.
Non *Leodice cariboa* Treadwell, 1921, p. 47, pl. iv. figs. 1–4, text-figs. 136–143.

Occurrence.—Dry Tortugas, 369 (2).

Eunice cariboa Grube var. *kinbergii* Webster.

Nicidion kinbergii Webster, 1884, p. 320, pl. xii. figs. 81–88 ; Treadwell, 1921, p. 91, pl. vi. figs. 5–8, text-figs. 324–332.

Occurrence.—Dry Tortugas, 54 (10) ; 63 (6) ; 224 (2) ; 309 (10) ; 321 (2) ; 341 (4).

Remarks.—This is by far the commonest Eunicid in the collection. It is distinguished from *E. cariboa* only by the absence of gills.

Onuphis magna (Andrews).

Treadwell, 1921, p. 78, pl. vii. figs. 1–5, text-figs. 279–287.

Occurrence.—Dry Tortugas, 327 (5).

Paramarphysa longula Ehlers.

Ehlers, 1887, p. 99, pl. xxix. figs. 3–12.
Paramarphysa obtusa Verrill, 1900, p. 646, and Treadwell, 1921, p. 76, text-figs. 269–278.

Occurrence.—Dry Tortugas, 369 (1).

Remarks.—This is a young specimen and measures 20 mm. by 1 mm. without the feet. The head and the dorsal surface of about the first twenty chætigers have a reddish-brown reticular pattern on a pale whitish background.

The second (achætous) segment is colourless and forms a white collar. Otherwise the colour in spirit is a pale yellow.

Ehlers's and Verrill's species seem to me to be identical, and the present specimen agrees with their accounts. The slight differences in length etc. of the bristles, on which Verrill separates his species, have little differential value. The subacicular chæta begins at the 25th chætiger.

Family **Lumbrinereidæ.**

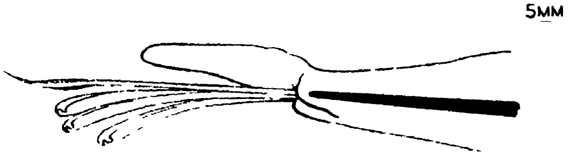
Lumbrinereis heteropoda Marenzeller. (Fig. 8.)

Crossland, 1924, p. 4, text-figs. 1–7.

Occurrence.—Dry Tortugas, 153 (1).

Remarks.—After some hesitation I have come to the conclusion that this specimen belongs to Marenzeller's species, which has never yet been recorded from the West Indies. The specimen is broken into two pieces and measures 2 mm. in breadth without the feet at the widest part. The body tapers anteriorly for about the first twenty chætigers: the hinder end is damaged, but it is clearly narrower than the middle of the body.

Fig. 8.



Lumbrinereis heteropoda Marenzeller. Posterior foot.

The head is triangular and pointed. The segments are very short and crowded, at about the 20th chætiger being eight times as broad as long, and this relation holds over most of the body. The feet are long and cylindrical, longer than in any other example of this species that I have seen.

In the front region their length is about one-quarter of the breadth of the body and in the hinder region nearly one-half. Similarly the posterior lip of the chæta-sac is in the front region about one-quarter of the length of the foot and in the hinder region about one-half (fig. 8).

The acicula are yellow. For the first 45 chætigers there are none but capillary bristles. After that there are both capillary bristles and simple crochets, and even in the hindermost region there are one or two capillary bristles still persisting. There are four short anal cirri.

The jaws seem to be typical of this species and agree closely with Crossland's account.

I find difficulty in deciding what is the relation of this form to *L. robusta* Ehlers. The only differences that I can find are that in *L. robusta* the acicula are said to be black and that Ehlers gives one tooth only in M. iii. instead of two, which is the normal number for *L. heteropoda.*

The shortness and crowding of the segments and the length of the feet, in both of which characters the present specimen agrees with Ehlers's account, have, I think, little differential value.

I am inclined to the opinion that *L. robusta* is a local form of the widely distributed *heteropoda* and that the present specimen is in some respects intermediate between Ehlers's form and a typical *heteropoda. L. branchiata* Treadwell appears to be a different form, with crochets in the anterior segments.

Lumbrinereis floridana Ehlers.

Ehlers, 1887, p. 103, pl. xxx. figs. 10–15.

Occurrence.—Dry Tortugas, 27 (1) ; 89 (2) ; 183 (2).

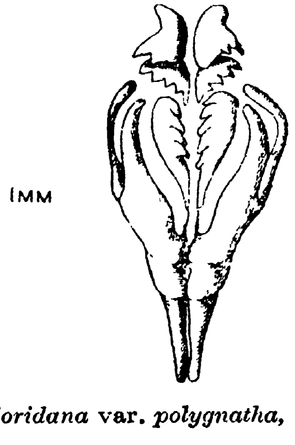
Remarks.– These are typical examples of this species. The prostomium is ovate. The compound crochets with short blades are confined to the first 10–15 chætigers. M. iii. has two teeth and M. iv. has one. The species is doubtfully separable from *L. gracilis* Ehlers.

Lumbrinereis floridana var. *polygnatha*, var. nov.
(Fig. 9.)

Occurrence.—Dry Tortugas, 309 (10); 321 (1); 369 (3).

Remarks.—The largest of these specimens measures 2 mm. across the body without the feet. With the exception of the examples from St. 309, which are evidently very young, they all have two triangular patches of brown pigment on the head. The prostomium is more rounded than it is in the stem-form, and in the larger of the specimens the compound crochets are continued to about the 25th chætiger. In the rest they are confined to the first 10 to 15 chætigers, as in the stem-form. The differences between the two forms is most marked in the jaws. Although the general structure of both maxilla and mandible are very similar in the two forms these specimens show a marked divergence in having between four and five teeth in M. iii. instead of two, and in having two teeth in M. iv. instead of one (fig. 9). In other respects the two forms are indistinguishable.

Fig. 9.



Lumbrinereis floridana var. *polygnatha*, var. nov. Upper jaws.

Arabel'a novecrinita Crossland.

Crossland, 1924, p. 71, text-figs. 89–95.

Occurrence.—Dry Tortugas, 424 (1).

Remarks.—This specimen belongs to the form of this species with symmetrical jaws, and is distinguished from all the previously described species of *Arabella* from the

West Indies by the possession of hooded acicular chætæ in the posterior region. *Arabella multidentata* Ehlers is regarded by Fauvel as identical with the European *A. iricolor* Montagu, of which *A. maculosa* Verrill is also according to Augener a synonym. The true *A. iricolor* has no hooded acicular chætæ, but it seems possible that these may have been overlooked in Ehlers's and Verrill's species. If it were found that Ehlers's *multidentata* has hooded acicular chætæ, both Crossland's species and Chamberlin's *A. mutans*, with which *A. novecrinita* is almost certainly identical, would fall into synonymy.

Family **Ariciidæ.**

HAPLOSCOLOPLOS, gen. nov.

Diagnosis.—As *Scoloplos*, but with crenate capillary bristles only.

Genotype, *Scoloplos cylindrifer* Ehlers.

Haploscoloplos tortugaensis, sp. n. (Figs. 10 *a*, *b*, *c*, & *d*.)

Occurrence.—Dry Tortugas, 347 (6).

Description.—These specimens are all fragmentary except one. All are very fragile, and the single complete example is tightly coiled, so that an accurate measurement is impossible. It measure approximately 30 mm. by 1 mm. for about 150 chætigers. The body tapers in front for the first fifteen segments, and for about the first twenty chætigers it is cylindrical. Behind this it becomes flat dorsally.

The head (fig. 10 *a*) is a narrow pointed cone, and I see no eyes. The buccal segment is achætous. In the anterior region both dorsal and ventral bristles come directly out of the body-wall, and there are no parapodial lobes. Immediately behind the bristle-bundles in both rami there are small triangular processes which I take to be the dorsal and ventral cirri (? podial papillæ). These are not evident in the first three chætigers. The division between thorax and abdomen is not so clearly defined as in a true *Scoloplos*, but the change seems to take place at the 19th chætiger, on which also the strap-like gills begin. At about the 15th chætiger the feet begin to move up towards the back, and the dorsal cirrus becomes rapidly longer and narrower. There seems to be very little change in the ventral cirrus, except that

Fig. 10 *b*.

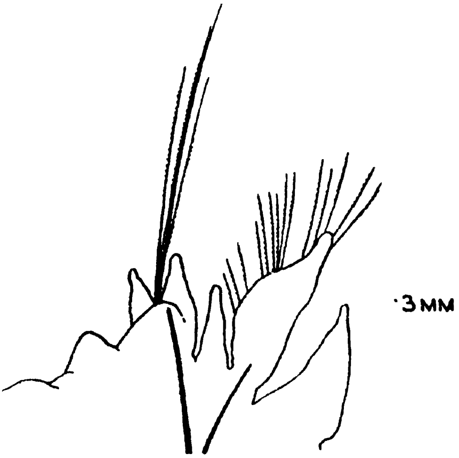


Fig. 10 *a*.

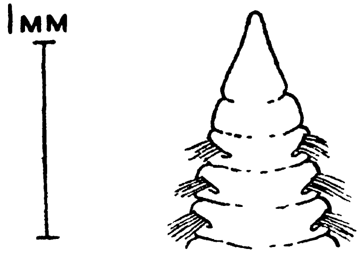


Fig. 10 *d*.

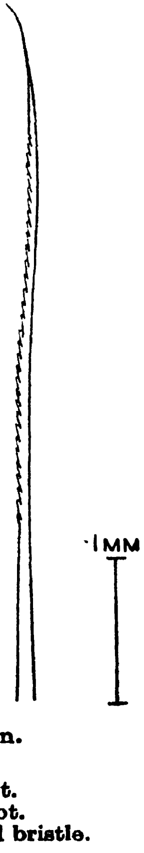
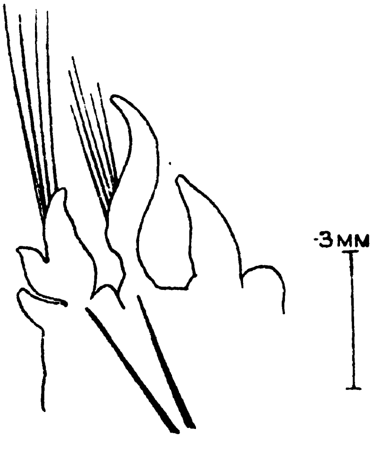


Fig. 10 *c*.



Haploscoloplos tortugaensis, sp. n.

Fig. 10 *a*.—Head.
Fig. 10 *b*.—Anterior abdominal foot.
Fig. 10 c.—Posterior abdominal foot.
Fig. 10 *d*.—Abdominal neuropodial bristle.

in the abdominal region it occupies a position below the bristles instead of immediately behind them. The thoracic bristles are thick and numerous; they are all of the same kind, rather short, crenate, capillary bristles. I see no acicula in the thoracic region and no subpodial papillæ.

In the anterior abdominal region (fig. 10 *b*) there are paired triangular gills about two-thirds the length of the dorsal cirri. The latter are narrowly lanceolate and shorter than the bristles. Below the dorsal cirrus is a digitiform intermediate cirrus, and below this a bilobed neuropodial process. There is a small triangular ventral cirrus. In the hinder region (fig. 10 *c*) the intermediate cirrus disappears, and all the appendages become narrower and more elongate; their relative lengths remain the same. The abdominal bristles (fig. 10 *d*) are of the same kind as those in the thorax, but they are much fewer in number and much longer and finer. There are thin delicate acicula in both rami. I see a pair of slender anal cirri.

In the hinder region I can see pad-like processes, recalling the ctenidia of the Sigalionids, lying between the gills; these I take to be ciliated dorsal organs. And in the position occupied by the intermediate cirri of the anterior abdominal region there are small rounded lobes, which I take to be a lateral organ, the homologue, according to Eisig, of the intermediate cirrus.

Remarks.—I have compared these specimens with some examples from New Zealand of *Scoloplos cylindrifer* Ehlers (1904, p. 45, pl. vi. figs. 16–19) named either by Benham or by Ehlers. They are clearly congeneric. Ehlers's species has a different form of neuropodium and the gills in the hinder region are branched. Moreover, it is a considerably larger species.

Eisig (1914, p. 407) is sceptical of the validity of Ehlers's observations on his species, especially in regard to the presence of only one kind of bristle. I may say that I can confirm Ehlers's observations as far as they go (see also Augener, 1914, p. 29).

It seems to me that *S. cylindrifer* and the present species are sufficiently distinct from all other members of the genus *Scoloplos* to merit the establishment of a new genus.

Family **Cirratulidæ.**

Cirratulus punctatus Grube.

Augener, 1918, p. 465, and 1927, p. 69.

Occurrence.—Dry Tortugas, 63 (2); 65 (2); 341 (1).

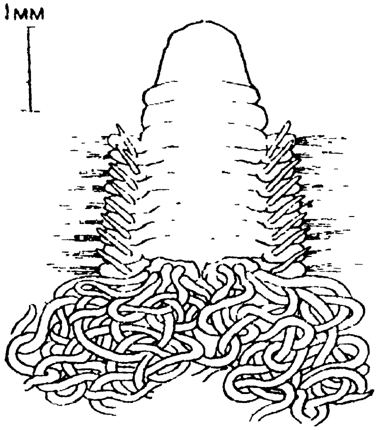
Audouinia tortugaensis (Augener). (Fig. 11.)

Cirratulus tortugaensis Augener, 1922, p. 46.

Occurrence.—Dry Tortugas, 341 (1).

Remarks.—This specimen measures 15 mm. by 3 mm. at the widest part. It is broadest in the middle of the body and tapers both in front and behind. It is very slightly peppered with black on the under surface in front; otherwise it has no colour. The head (fig. 11) is in no sense conical, but cut off squarely in front. I see no eyes. There are two achætous segments behind the mouth. Gills are present on the second chætiger and are continued almost to the hinder end. I cannot tell whether they are lost from the first chætiger and second buccal segment. In front they are inserted just above the notopodium, and in the hinder region they lie some distance above it; but the distance from gill to notopodium is always less than that between the rami of the feet. The tentacles are extremely numerous and long;

11.



Audouinia tortugaensis (Augener).
Head and anterior region.

they lie in the 9th and 10th chætigers. In regard to the feet, there are both capillary bristles and hooks dorsally and ventrally in all the feet of the body, and hooks are present in the notopodium of the 1st chætiger. The dorsal hooks are considerably longer than the ventral, but of the same kind.

This species is characterized by the position of the tentacles on the 9th and 10th chætigers and by the presence of hooks and capillary bristles in all the feet of the body, both dorsally and ventrally.

Family **Ctenodrilidæ.**

Ctenodrilus serratus (O. Schmidt).

Fauvel, 1927, p. 108, fig. 38, *a–e*.

Occurrence.—Dry Tortugas, 361 (numerous); 431 (numerous).

Remarks.—I can find nothing to distinguish these from the European form. This is a new record for the West Indies.

Family **Opheliidæ.**

Armandia maculata (Webster).

Ophelina maculata Webster, 1884, p. 322, pl. xi. figs. 54–55.
Armandia maculata Augener, 1927, p. 67.

Occurrence.—Dry Tortugas, 259 (1); 10 (1).

Remarks.—The colour of one of these specimens is pearl-grey, as in the original description, and not chocolate-brown as Augener gives it. There are twenty-nine chætigers, twenty-five pairs of gills, and eleven pairs of eyes. The pharynx is provided with filiform lobes as in *A. polyophthalma* Kükenthal, of which the present species is only a variety.

Family **Terebellidæ.**

Lanicides bilobata (Grube), var. *antillensis* Augener. (Figs. 12 *a* & *b*.)

Nicolea bilobata var. *antillensis* Augener, 1922, p. 47, and 1927, p. 72.

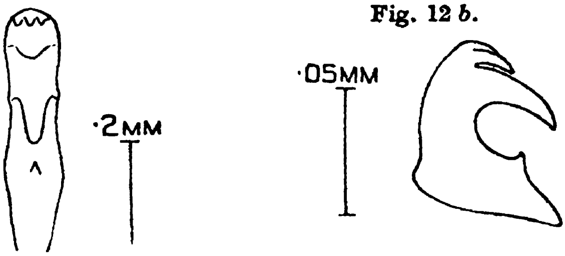
Occurrence.—Dry Tortugas, 321 (15).

Remarks.—Augener has united *Terebella bilobata* Grube with *Terebella vayssieri* Gravier (1911, pl. x. figs. 121–123, pl. xi. figs. 134–135), which Hessle includes in his genus *Lanicides*. The present specimens, the largest of which measures only 20 mm. in length without the tentacles, agree with Augener's account of this tropical variety of an Antarctic and sub-Antarctic species. The tropical variety is much smaller than the stem-form and has different hooks (figs. 12 *a* & *b*). The formula appears to be 1, 2, 3 3 3. There is only a single tooth in the second row. Nephridial papillæ are not evident.

This species is probably identical with *Nicolea taboguillœ* Chamberlin.

Fig. 12 *a*.

Fig. 12 *b*.



Lanicides bilobata (Grube) var. *antillensis* Augener.
Fig. 12 *a*.—Thoracic hook from front.
Fig. 12 *b*.—Thoracic hook from side.

Terebellides strœmi Sars.

Fauvel, 1927, p. 291, ;. 100, *i–q*.
Augener, 1927, p. 73.

Occurrence.—Dry Tortugas, 321 (6) ; 347 (3) ; 10 (1).

Thelepus setosus (Quatrefages).

Fauvel, 1927, p. 273, fig. 95, *a–h*.
Augener, 1927, 72.

Occurrence.—Dry Tortugas, 347 (1).

Terebella sp.

Occurrence.—Dry Tortugas, 369 (5).

Remarks.—These specimens are in bad condition. They appear to agree with *T. lapidaria*, except that the dorsal bristles show no denticulated calix, but the toothed, terminal part appears to be a direct continuation of the shaft. They may be ill-preserved examples of *T. reticulata* Ehlers.

Family **Sabellidæ.**

Dasychone bairdi M'Intosh.

M'Intosh, 1885, p. 495, pl. xxx. A, figs. 13–15; pl. xxxix. A, figs. 7 & 9.

Occurrence.—Dry Tortugas, 328 (25); 347 (5).

Remarks.—These are all very much smaller than M'Intosh's type-speciment; they measure on the average about 10 mm. for the body and 5 mm. for the gills. M'Intosh's figure 9 on plate xxxix. A is misleading, for it gives the impression that the dorsal branchial stylodes are expanded at their tips. This is not so, for they are all cirriform.

Hypsicomus phœotœnia (Schmarda).

Fauvel, 1927, p. 312, fig. 108, *a–l*.

Occurrence.—Dry Tortugas, 50 (1).

Remarks.—I see no eyes. The collar is entire ventrally. *H. torquatus* Grube, recorded from the West Indies, is a synonym of this species. In my opinion the *Parasabella sulfurea* of Treadwell is the same as *Hypsicomus circumspiciens* Ehlers, the type-species of Augener's *Hypsicomatopsis*. I confess that I do not see the necessity for the latter genus.

Sabella melanostigma Schmarda.

Augener, 1927, p. 73.

Occurrence.—Dry Tortugas, 10 (6).

Family **Serpulidæ.**

Protula tubularia (Montagu).

Fauvel, 1927, p. 382, fig. 130, *a–l*.

Occurrence.—Dry Tortugas, 284 (5).

Remarks.—Except that I can see no eyes, I can find nothing to distinguish these specimens from Montagu's species; moreover, the tubes are typical. *P. submedia* Augener (1906, p. 188), from below the 100 fathom line, has a tube with very distinct lines of growth running round it (Augener, pl. viii. fig. 152), and the abdominal bristles are different. *P. appendiculata* Schmarda (*v.* Augener, 1925, p. 38) has the bristle-bundle of the collar much reduced and a smaller number of teeth to its hooks. *P. longiseta* Schmarda (Augener, *op. cit.* p. 39) and *P. antennata* Ehlers (1887, p. 321) are structurally very close to *P. tubularia*, but both build a tube with longitudinal ridges, quite different from the smooth tube of *P. tubularia*.

I believe this to be the first record of Montagu's species from the West Indies.

Serpula (*Crucigera*) *websteri* (Benedict).

Crucigera websteri Benedict, 1887, p. 550, pl. xxi. figs. 24, 25, pl. xxii. figs. 26–30.
Monro, 1928, p. 101, with synonymy.

Occurrence.—Dry Tortugas, 369 (1).

Remarks.—This species is also found on the American Pacific coast.

Pomatostegus stellatus (Abildgaard).

Augener, 1927, p. 79; Benedict, 1887, p. 551, pl. xxii. figs. 32–35, pl. xxiii. figs. 36, 37.

Occurrence.—Dry Tortugas, 183 (1).

Spirobranchus giganteus (Pallas).

Ehlers, 1887, p. 286, pl. lvii. figs. 1 7.

Occurrence.—Dry Tortugas, 122 (4).

Spirorbis sp. divers.

Occurrence.—Dry Tortugas, 136, 168, 215, 221, 234, 237 (numerous).

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XXVIII.—*Redescription of an imperfectly-known Species of Isopod of the Family* Sphæromidæ, Holotelson tuberculatum *Richardson.* By CHIA-JUI SHEN, B.S., Research Fellow of the China Foundation for the Promotion of Education and Culture, Peiping.

THERE appears to be no further record of the genus *Holotelson* since it was established in the year 1910 by Richardson to contain a single species, *H. tuberculatum* from Japan. Recently I obtained some specimens from the coasts of the Shantung Peninsula, China, but hesitated to refer them to the Japanese species until, through the kindness of Dr. Isabella Gordon, British Museum (Nat. Hist.), I was able to examine a male cotype lent by the U.S. National Museum. My material appears to be referable to *H. tuberculatum*, since it differs from the cotype only as regards the first pleon segment, which is not covered by the last peræon segment. This difference may be due to the stage of growth. Although the striæ on the peræon segments are very distinct they were not figured by Richardson. In order to make this rare species better known a fuller description and more detailed figures are given below. The generic characters are also slightly modified.

Family **Sphæromidæ**.

Section EUBRANCHIATÆ.

Genus HOLOTELSON Richardson.

Richardson, 1910, Proc. U.S. Nat. Mus. vol. xxxvii. p. 93.

Maxillipeds with fourth, fifth, and sixth joints inwardly produced.

Peræopods biunguiculate.

Pleopods.—Second pair of male with a stylet on the endopod. Third pair with exopod two-jointed. Fourth and fifth pairs with both endopod and exopod thick and fleshy, with transverse folds and marginal setæ. Exopod of fifth pleopod with an articulation near its end and two protuberances on the terminal joint.

Peræon.—All segments marked with somewhat longitudinal striæ on either side. Seventh segment produced posteriorly into two rounded lobes, one on either side of the median line, the lobes smaller in female.

Pleon.—Fifth segment produced into a tubercle on the posterior margin, along the median line.

Telson produced posteriorly into a long process, at base of which on either side is a small rounded lobe. The median process shorter in female, the lateral processes also reduced. Exopod of uropod somewhat smaller than the endopod in the female, but equal to it in the male.

Holotelson tuberculatum Richardson. (Figs. 1–9.)

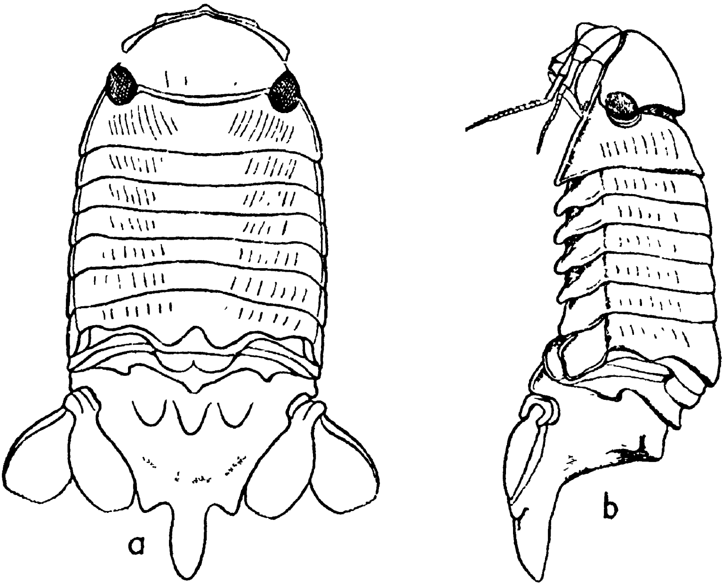
Holotelson tuberculatus Richardson, 1910, Proc. U.S. Nat. Mus. vol. xxxvii. pp. 93–94, figs. 17–20.

Body oblong-ovate, twice as long as broad, dorsal surface strongly convex.

Cephalon transversely oval in outline, anterior margin strongly convex and produced into a small median lobe, posterior margin smoothly convex. Eyes prominent, composite, situated postero-laterally, with a considerable portion inserted into the first segment of peræon.

Peræon.—Epimera large, pointing posteriorly. Dorsal surface of each segment marked with longitudinal striæ, nine to ten on the first segment, six to seven on each of the posterior segments. First segment longer than any of the succeeding segments, which are equal in length.

Fig. 1.



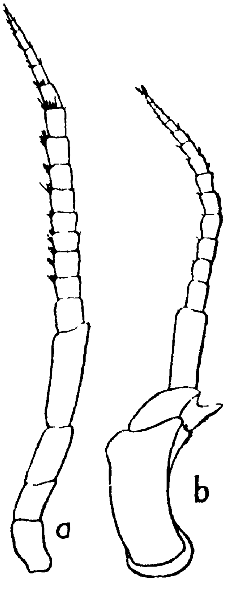
Holotelson tuberculatum Richardson.
a, dorsal view of male ; *b*, lateral view of the same. × 5·8.

Seventh segment subequal in length to first segment, epimera very broad, posterior margin produced into two large rounded lobes, at base of which on either side is a small smoothly rounded lobe, all overlapping the anterior segment of pleon (fig. 1, *a*).

Pleon.—Segments all rigidly connected. First segment narrow ; the posterior margin roundly concave on either side of a broad median truncated lobe which conceals part of the two succeeding segments (fig. 1, *a*). Third segment narrow, produced backwards into two median rounded lobes. Fourth segment somewhat broadly triangular in shape, posterior border emarginated on either side of the median rounded apex so as to form a small lateral lobe (fig. 1, *a*). The pleon segments are poorly developed in younger specimens as compared with those in the adult (fig. 3, *c*).

Telson very convex, dorsal surface bearing a transverse row of three large median triangular lobes. Apex produced into a long finger-like process, at base of which on either side is a small triangular lobe (fig. 1, *a*).

Fig. 2.



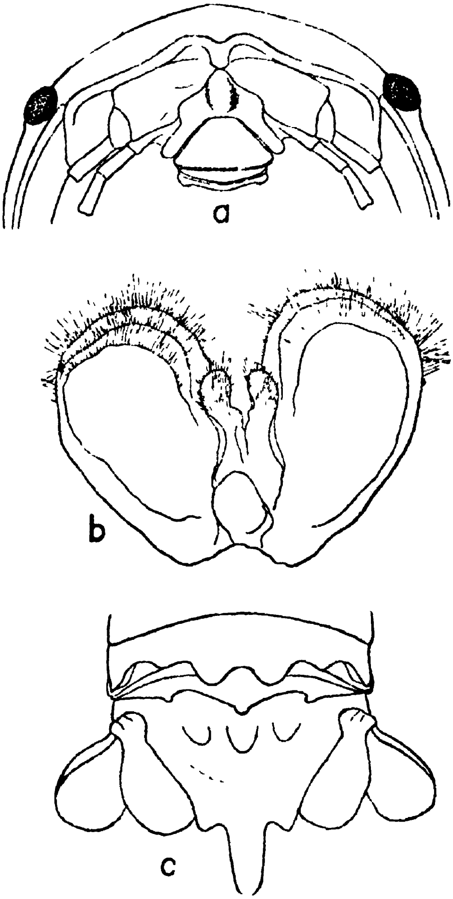
Holotelson tuberculatum Richardson.
a, antenna ; *b*, antennula. × 20.

Antennula.—Peduncle three-jointed, proximal joint very long and stout, distal portion broader than basal and curved inward. Second about one-third the length of the proximal, distal dorsal angle produced posteriorly into an acute process. Third joint slender, about twice as long as second. Flagellum fourteen-jointed, extending to middle of first segment of peræon, terminal segment bearing two long setæ (fig. 2, *b*).

Antenna.—Peduncle four-jointed, proximal joint slightly longer than second, third slightly longer than proximal, fourth about twice as long as the third. Flagellum fifteen-jointed, each with an apical tuft of setæ (fig. 2, *a*).

Epistome convex at middle portion, produced dorsally

Fig. 3.



Holotelson tuberculatum Richardson.

a, facial view of head; *b*, ventral view of labium; *c*, dorsal view of pleon of younger male specimen. *a*, × 10·5; *b*, × 40; *c*, × 7·5.

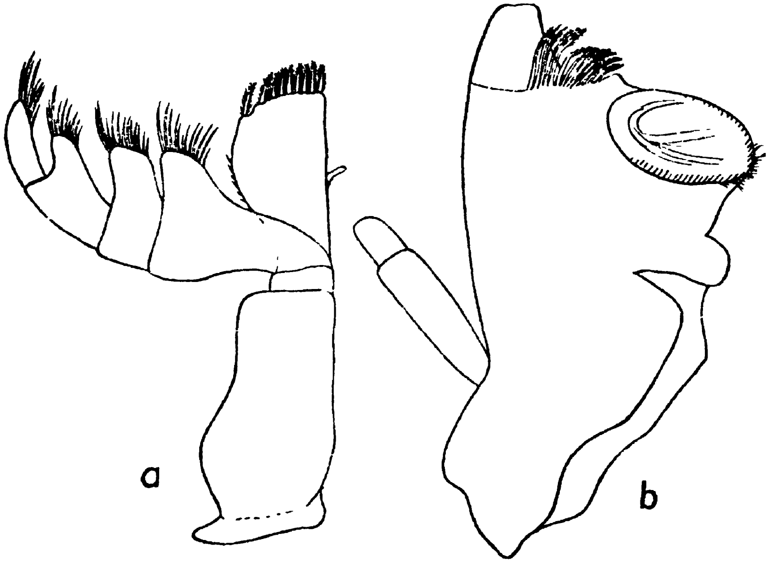
into a round apex and divided ventrally into two slender arms, each with apex rounded; lateral margin slightly concave at basal portion and strongly convex at middle portion; distal margin between the two arms almost transversely straight (fig. 3, *a*).

Labrum somewhat trapezoid, broader than long, distal margin twice as broad as basal margin, laterodistal angles rounded; below distal margin there are some accessory processes (fig. 3, *a*).

Labium composed of two elongate-ovate lobes, with the distal portions closely setose and two small elongated median hairy lobes situated between them (fig. 3, *b*).

Mandible large and strong, cutting-edge in right one broad and blunt, very obscurely tridentate; outer cutting-edge in left entire, secondary cutting-edge tridentate. Spine-rows in either right or left consisting of thirteen spines, of which five are in one division and eight in another; molar process well developed; surface denticulate and borders setulose. Palp stout, two-jointed, basal joint long and broad, distal small and short, about one-third the length of the former (fig. 4, *b*).

Fig. 4.

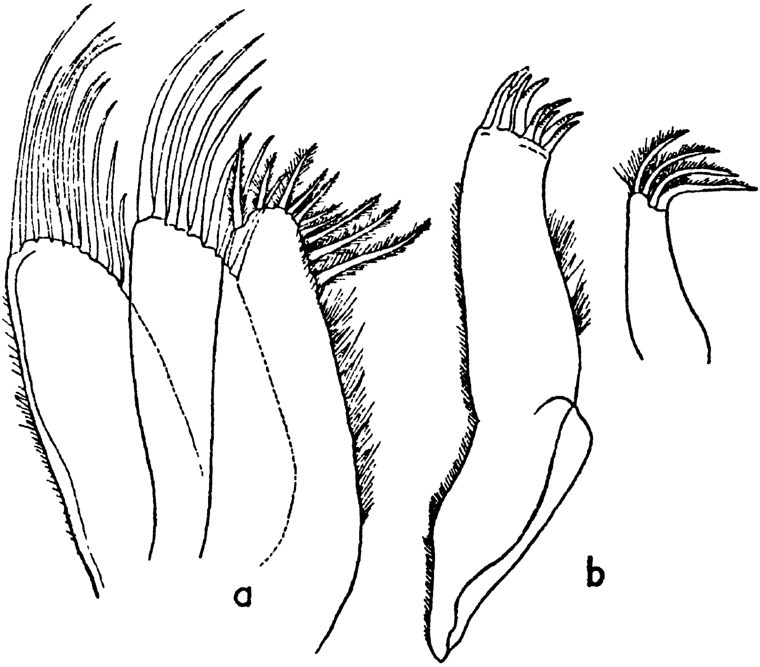


Holotelson tuberculatum Richardson.
a, third maxilliped; *b*, mandible. *a*, × 47·5;
b, × 42·5 (from right side).

First maxilla.—Outer plate bearing terminally about eleven spines, all probably transversely striated, arranged in two groups, five on inner and six on outer side. Inner plate bearing terminally four long curved plumose setæ, of which the inner one is the largest and most strongly bent (fig. 5, *b*).

Second maxilla.—Two outer plates almost similar in shape, the lateral one bearing terminally about eleven long setæ and the internal one bearing about eight similar setæ. Inner plate slightly narrower at distal portion than the two outer plates, bearing distally ten plumose setæ, irregular in length (fig. 5, *a*).

Fig. 5.

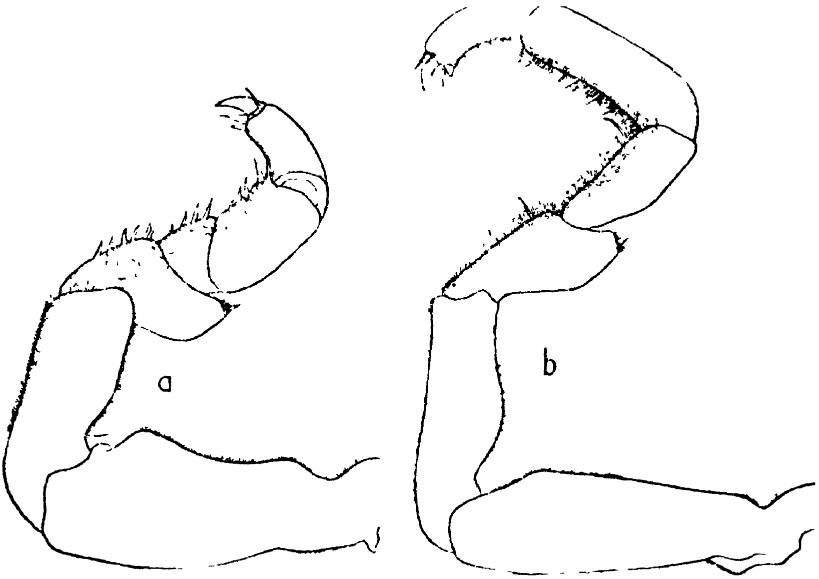


Holotelson tuberculatum Richardson.
a, second maxilla ; *b*, first maxilla. *a*, × 88·5 ; *b*, × 42·5 (from right side).

Maxilliped.—First joint short. Second large and long, convex at antero-lateral portion. Third small, much narrower than second. Fourth to seventh joints forming a palp ; fourth, fifth, and sixth each strongly produced anteriorly into a lobe, seventh slender, all setulose. Inner plate slightly shorter than second joint, apex almost truncate, outer margin rounded, inner margin straight and bearing a sensory process at middle region (fig. 4, *a*).

Peræopods biunguiculate, anterior pairs shorter than posterior. First peræopod more or less pubescent on ventral surface except the basis, which has two convexities on anterior margin. Ischium bearing a ventral distal spine and a dorsal proximal one. Merus, carpus, and propodus each armed ventrally with a series of large spines. Merus with dorso-distal angle strongly produced into a lobe, which is pubescent and armed with a spine at the apex. Carpus small. Propodus and dactylus subequal in length; the latter bears terminally a large and a small claw-like spines besides some setæ. Second peræopod longer than first, ventral surface of four terminal joints pubescent and setose; among the setæ there are some longer and stout ones (fig. 6, *a*, *b*).

Fig. 6.

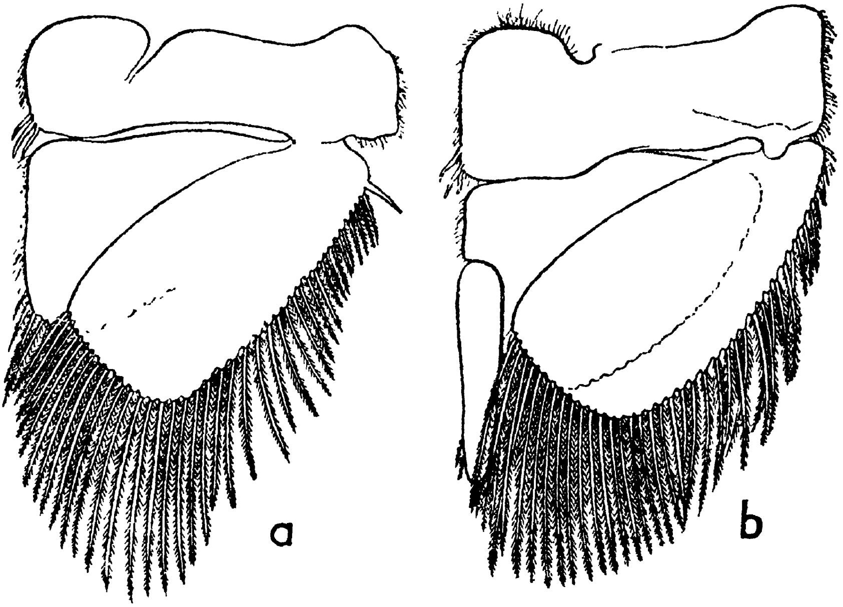


Holotelson tuberculatum Richardson.
a, first peræopod; *b*, second peræopod. × 26.

Male appendages situated on seventh segment of peræon at some distance apart. Dorsal surface concave, ventral convex. Inner margin thickened and covered with short setæ. Outer margin slightly thickened. Apices blunt, narrower than basal portions (fig. 8, *a*).

Pleopods.—First to third pleopods bearing long plumose setæ on both endopod and exopod, and peduncle bearing three hooked spines on inner apex. *First pleopod*: outer ramus armed with an acute spine on outer proximal apex (fig. 7, *a*). *Second pleopod*: inner ramus bearing a male stylet at middle of inner margin, extending far beyond apex of ramus and nearly parallel to inner margin, apex rounded (fig. 7, *b*). *Third pleopod*: outer ramus distinctly two-jointed (fig. 8, *b*). *Fourth* and *fifth pleopods* without long plumose setæ, all thick and fleshy, folds well developed inside, margins more or less setulose. *Fourth pleopod* : outer ramus granulose and with a spinule at apex ; inner ramus armed with a large spine at outer proximal portion (fig. 9, *a*). *Fifth pleopod* : outer ramus with an articulation near distal portion ; distal joint with two bosses near apex, one projecting ventrally and another

Fig. 7.



Holotelson tuberculatum Richardson.
a, first pleopod ; *b*, second pleopod. *a*, × 18; *b*, × 19 (from left side).

dorsally, surface granulose; inner ramus broad, apex rounded (fig. 9, *b*).

Fig. 8.

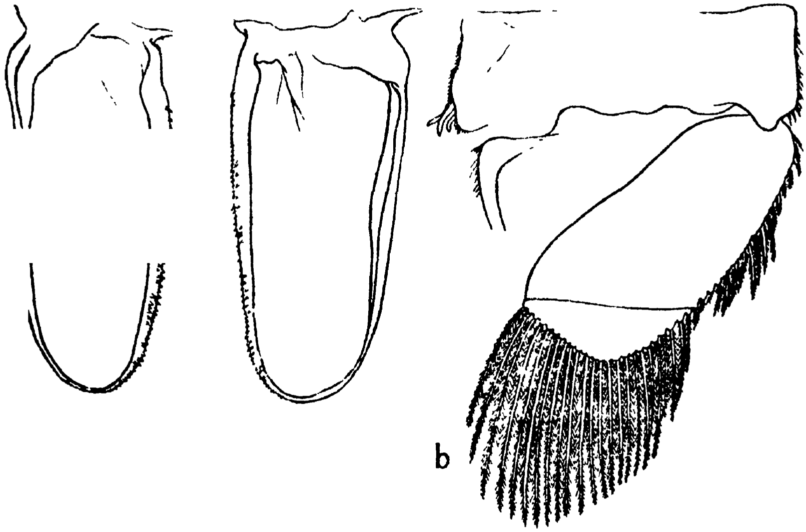
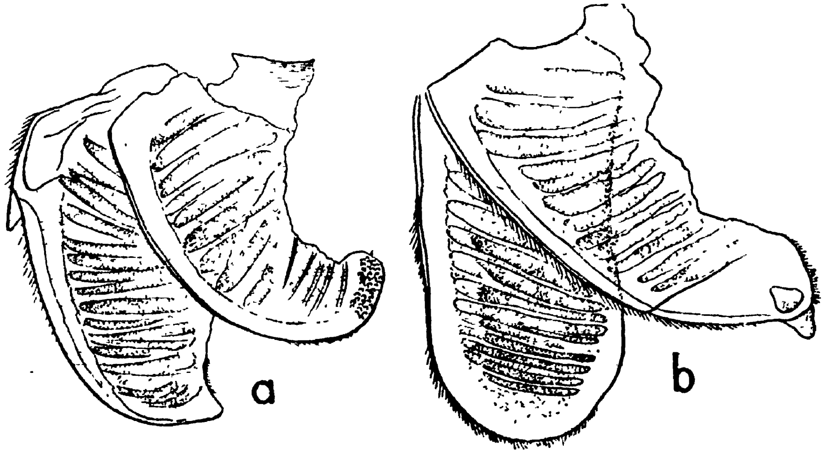


Fig. 9.



Holotelson tuberculatum **Richardson.**

Fig. 8.—*a*, dorsal view of male appendages; *b*, third pleopod. *a*, × 58; *b*, × 18 (*b*, from left side).

Fig. 9.—*a*, fourth pleopod; *b*, fifth pleopod. × 16 (from right side).

Uropods.—Outer and inner rami similar in shape, the latter usually longer and narrower than the former, their distal margins almost truncate and finely serrate (fig. 1, *a*). Inner ramus immovable, outer ramus thickened on outer margin, capable of folding under inner one.

Colour.—Body pale glass-green covered closely with eosine-pink and celadine-green dots on head, seventh peræon segment, and pleon.

Measurements.—Male : length 12 mm., breadth 6 mm., length of caudal process 1·5 mm., distance between male appendages 0·1 mm. (Type : length to breadth 11 : 5 mm.)

Localities.—Tengchow, 1 juv. ♂, 1 adult ♂, 26/v./1930 (*C. Chang*) ; Yangmatao, 1 juv. ♂, 2/vii./1930 (*C. J. Shen*).

Habitat.—Among green algæ on rocks at low tide.

Type-locality.—Shore of Mororan, Japan. Type in the U.S. National Museum, Washington, D.C.

Distribution.—China : Shantung Peninsula (northern coast) ; Japan.

XXIX.—*Notes on Five Species of Spiders.*

By A. RANDELL JACKSON.

Hygrolycosa rubrofasciata Ohlert (1).

Syn. *Lycosa farrenii* Cambridge (2).

I have known for some years of this synonymy, and sent specimens of *L. farrenii* from Wicken Fen to the late E. Simon. He compared them with specimens of *H. rubrofasciata* and said they were identical. Lately Mr. Bartels kindly sent me specimens from Switzerland, which I compared with Wicken examples, and there is no doubt of their identity.

The species was described by Ohlert (1) in 1867 as *Trochosa rubrofasciata*, Cambridge's description as *Lycosa farrenii* was in 1870 (2). I have not seen Ohlert's paper, but Bösenberg (3) says the specimens were taken in Prussia, and that Bertkau also took it in that country. It was recorded by Dr. Schenkel (4) from Esthonia in 1924 from specimens taken near Dorpat. Dr. Bartels (5) recorded it from Berne in 1931, and sent me some of the specimens. In Britain it is common at Wicken Fen, and Mr. L. A. Carr took specimens in Lincolnshire and in Sherwood Forest, Notts. It would seem to be an eastern species. Reimoser (6) records it from France, but apparently in error. It is mentioned in Simon's 'Arachnides de France' (7), but not as occurring in that country. These are the only records I have been able to find. Cambridge (8) at one time thought his *L. farrenii* might be identical with *Lycosa ferruginea* of L. Koch, and F. P. Smith (9) followed him in this, later both (10, 11) of them withdrew from this standpoint, which was quite untenable. The new genus *Hygrolycosa* was created by Dahl (12) in 1908, and is quite convenient. Possibly, however, two genera would be really sufficient for our British Lycosidæ.

(1) Ohlert, E. Aran. Prov. Preuss. 1867. Leipzig.
(2) Cambridge, O. P. Trans. Linnæan Soc. vol. xxvii., Jan. 20, 1870, p. 395, pl. liv. figs. 2.
(3) Bösenberg, W. 'Die Spinnen Deutschlands,' p. 403, Taf. xxxviii. figs. 594 (1901-1903).
(4) Schenkel. E. "Zur Kenntnis des Estländischen Moorfauna." Sitzungsberichte der Naturforsch.-Gesellschaft bei der Universität Dorpat." Dorpat, 1924, p. 64.
(5) Bartels, M. "Beitrag zur Kenntnis der Schweizorischen Spinnenfauna Geneva." Revue Suisse de Zoologie, 1931, p. 25.
(6) Reimoser, E. 'Katalog der Echten-Spinnen (Araneida) des Palaarktischen Gebietes.' Wien, 1919, p. 152.
(7) Simon, E. 'Les Arachnides de France,' vol. iii. p. 275.
(8) Cambridge, O. P. Proc. Dorset. Nat. Hist. & Antiq. Field Club, 1903, p. 160.
(9) Smith, F. P. Journ. Quekett Microscopical Club, April 1907, pp. 28 & 29.
(10) Cambridge, O. P. Proc. Dorset. Nat. Hist. & Antiq. Field Club, 1908, p. 182.
(11) Smith, F. P. Journ. Quekett Micros. Club, Nov. 1907.
(12) Dahl, F. 'Die Lycosiden Deutschlands.' Halle, 1908.

Zornella armata Banks.

Syn. *Zornella mathiseni* Jackson (1).

Professor Crosby, having kindly sent me a male of the former species, I have compared it with my type of *Z. mathiseni* and find them identical. The latter specific name must therefore be withdrawn. Mr. Banks' species was described in 1905 sub *Tmeticus armatus* (2). Messrs. Crosby and Bishop in a recent paper (3) assume that the species is identical with *Linyphia cultrigera* L. Koch (4), but in face of that able author's figures I fail to see how this can be maintained, unless a comparison with the actual types establishes it.

The species has occurred in several localities in the United States, also in British Columbia, Vancouver, Alaska, and Lapland. L. Koch's species *L. cultrigera* was found in several Siberian localities.

(1) Jackson, A. R. 'Results of the Oxford University Expedition to Lapland: Araneæ and Opiliones,' pp. 103, 106, 107, 108, & 109, figs. 1, 2, 3, & 4. Proceedings of the Zoological Society of London, 1932.

(2) Banks, N. Ent. Soc. Wash. Proc. vii. p. 98, pl. ii. fig. 12, 1905.

(3) Crosby, C. R., & Bishop, S. C. 'American Spiders: Erigoneæ, Males with Cephalic Pits.' Annals of the Entom. Soc. of America, vol. xxvi. no. 1, March 1933.

(4) Koch, L. Arach. aus Siberien und Novaja Semlja eingesammelt von der Schwedischen Exped. im Jahre 1875. Kgl. Svensk Vetenskapsakad. Handlingar, N.F. xvi. 1878–89.

Diplocentria rivalis Cambridge.

This species was described sub *Tmeticus* (1), the genus *Diplocentria* (2) being created for it afterwards by J. E. Hull. The late E. Simon (3), or his editors, for some reason considered it to be identical with *Linyphia torrentum* Kulczynski (4), and made the change of name, the latter having priority. Mr. Hull informed me in a letter that he was sure this was incorrect. In the Pickard-Cambridge collection at Oxford there is a bottle containing a number of species of spiders, the whole being labelled "Kulczynski Tatra." Amongst these is a tube containing both sexes of *L. torrentum* Kulcz. These correspond well with Kulczynski's description and figures, and though these are not, of course, the actual types, I feel sure that they are really *L. torrentum* Kulczynski. They do not in the least resemble *D. rivalis* Camb., and I cannot understand how the error arose in 'Les Arachnides de France' (3). There must have been a substitution of specimens or some similar lapsus, as no one could possibly mistake the two species, which belong to very different genera. Simon's remarks fit *D. rivalis* quite well (5)—it is his identification of the species with *L. torrentum* Kulcz., which is incorrect, the latter species being a typical *Stylophora*. Personally, I feel it was unnecessary to divide the genus *Bathyphantes* as Simon (5) did. I regret to say that, without looking the matter up, I followed Simon and recorded this species lately as *Diplocentria torrentum* Kulcz. (6). I here recant, and confess my error.

(1) Cambridge, O. P. "On new and rare British Arachnida." Proc. Dorset. Nat. Hist. & Antiq. Field Club, pp. 61 & 62, pl. A. figs. 14–18 (1905).

(2) Hull, J. E. 'Trans. Nat. Hist. Soc. of Northumberland, Durham, and Newcastle-upon-Tyne.' New series, vol. iii pt. 3, p. 581.

(3) SIMON, E. 'Les Arachnides de France,' vol. VI. pt. 3, p. 747 (1929).
(4) KULCZYNSKI, W. 'Araneæ Novæ in Montibus Tatricis . . . . collectæ.' W. Krakowie, pp. 10 & 11, pl. i. fig. 6 (1882).
(5) SIMON, E. *Loc. cit.* p. 642.
(6) JACKSON, A. R. "On new and rare British Spiders." Proc. Dorset. Nat. Hist. & Archæological Society, p. 9 (1932).

Lophocarenum elongatum Wider.

A few years ago I recorded females of this species as having been taken by me in Scotland in July 1914 (1). I never doubted the correctness of the identification, but in the Pickard-Cambridge collection at Oxford I found examples of this species from Warsaw. The females correspond well with my Scottish examples, thus confirming my identification happily. It is a distinct little thing even in this sex.

(1) JACKSON, A. R. "On new and rare British Spiders." Proc. Dorset. Nat. Hist. and Antiq. Field Club, p. 12 (1924).

Araneus inconspicuus Sim.

This species was described by Simon (1) in 1874 sub *Epeira.* A little later Cambridge recorded *Epeira westringii* (2) Thor. from a male captured at Glanville's Wootton, Dorset, by C. W. Dale in June 1877.

Kulczynski (3), in 1905, redescribed and figured *Araneus inconspicuus* Simon, from a male sent to him by Simon, which was captured "in montibus Pyrenæis." Cambridge (4), in 1906, stated that after reading Kulczynski's paper he believed his *E. westringii* Thor., from Dorsetshire, must be *inconspicuus* Simon. In 1913, however, he (5) recorded as *E. westringii* Thor. a male captured in 1912 at Witham, Berkshire, by Mr. T. Collins. In 1924 (6) I recorded *E. inconspicua* Sim. from the New Forest, where I stated it was captured by Dr. Haines in 1923. I also, having examined the Witham specimen, stated that it really was *E. cucurbitina opisthographa* Kulcz. Professor H. Wiehle's (7) book on the family Araneidæ appeared in 1931, and he there gave figures of *Araneus inconspicuus* Simon and *A. alpicus* L. Koch. I was struck by the figures of the latter species and felt sure that the New Forest specimens (of which I then had several kindly sent by Dr. Haines) belonged to that species. I sent a specimen to Professor Wiehle, and he agreed with this. In 1932 (8) I recorded *A. alpicus* L. Koch as a British species, and since then I have had the opportunity of comparing the British type of *A. inconspicuus* Sim., from Glanville's Wootton, with the New Forest males of *A. alpicus* L. Koch.

Professor Wiehle does not appear certain of the distinctness of *A. alpicus* and *A. inconspicuus.* To use his own words, he says " Man darf sagen dass *A. inconspicua* an der Grenze zwischen Art und Varietät steht " (7). The figure he gives of the palpi of *A. inconspicuus* agrees well with the British type. Kulczynski's (3) figures are similar, but not identical, and I do not feel sure that his *A. inconspicuus* is the same as Professor Wiehle's and the British type, which I believe to be identical with the latter. The British type is a small rather decolorized specimen. The back of the abdomen, however, bears four black spots arranged in a quadrilateral, which should be absent in this form according to H. Wiehle. By the assumption that *A. inconspicuus* is a small stunted form of *A. alpicus*, the differences between Kulczynski's specimen, on the one hand, and Professor Wiehle's figures and the British type could be explained, as such specimens would probably not be exactly alike. But I am not sure that this assumption is justifiable, and no other British male specimen similar to the British type of *A. inconspicuus* has yet been seen. So both forms must at present remain on the British list, our spiders of this group known up to date being :—

Araneus cucurbitinus Clerck.
—— —— *opisthographus* Kulcz.
—— *alpicus* L. Koch.
—— *inconspicuus* Simon-Cambridge.

(1) Simon, E. ' Arachnides de France.' Tome 1, 1874, p. 84 ; see also vol. vi. partie 3, p. 762 (1929).
(2) Cambridge, O. P. ' Spiders of Dorset,' pp. 260 & 261 (1879)
(3) Kulczynski, W. " Fragmenta Arachnologica." Bulletin de l'academie des Sciences de Cracovie, pl. vii. figs. 8, 18, 28 (1905).
(4) Cambridge, O. P. Proc. Dorset. Nat. Hist. & Antiq. Field Club, 1906, p. 79.
(5) Cambridge, O. P. Proc. Dorset. Nat. Hist. & Antiq. Field Club, 1913, p. 123.
(6) Jackson, A. R. Proc. Dorset. Nat. Hist. & Antiq. Field Club, 1924, p. 17.
(7) Wiehle, H. " Spinnentiere oder Arachnoidea.—VI. 27. Fam. Araneidæ." Sonderabdruck aus die Tierwelt Deutschlands, 23 Teil, pp. 112 & 113 (1931).
(8) Jackson, A. R. " On new and rare British Spiders." Dorset. Nat. Hist. & Archæological Society, pp. 12 & 13 (1932).

XXX.—Lumbricus terrestris *Linn., a Specimen with Asymmetrical Genital Organs.* By G. E. H. FOXON, B.A. (Department of Zoology, University of Glasgow).

ABNORMALITIES in the earthworms are far from uncommon, but the specimen which is the subject of this note presents a very unusual arrangement of the genital organs, such as does not appear to have been encountered by other workers.

One of the most frequent departures from the normal to be seen in the Lumbricidæ is in the position of the copulatory papillæ, which are often asymmetrically arranged (see Pickford, 1926). The position of the genital pores appears to be very stable, although Coonfield * (1929) has described specimens of *Lumbricus terrestris* that had supplementary male pores on the 16th somite; but these pores were not functional, and in only a few specimens was there any modification of the male duct.

Other records of abnormal genitalia in the Lumbricidæ are given by Pickford (1926), Benham (1891), and Woodward (1892 and 1893). Pickford described a specimen of *Lumbricus castaneus* in which the genital organs and their ducts were situated one segment further forward than usual. The specimen of *L. terrestris,* described by Benham, had the genital pores moved one segment forward on the right-hand side; the seminal vesicles were abnormally arranged, but the ciliated funnels and the testes were in their normal positions; the ovary on the right side was in the 12th segment, that of the left side being in the 13th segment. Woodward, who described several specimens of *Lumbricus* spp. and *Allolobophora* spp., which had additional pairs of ovaries in successive segments, suggested that the condition described by Benham might be due to unequal development on the two sides of the body in a specimen which had the potentiality for developing more than one pair of ovaries. The specimen described below does not throw any more light on this problem, but it differs in several respects from any other yet described.

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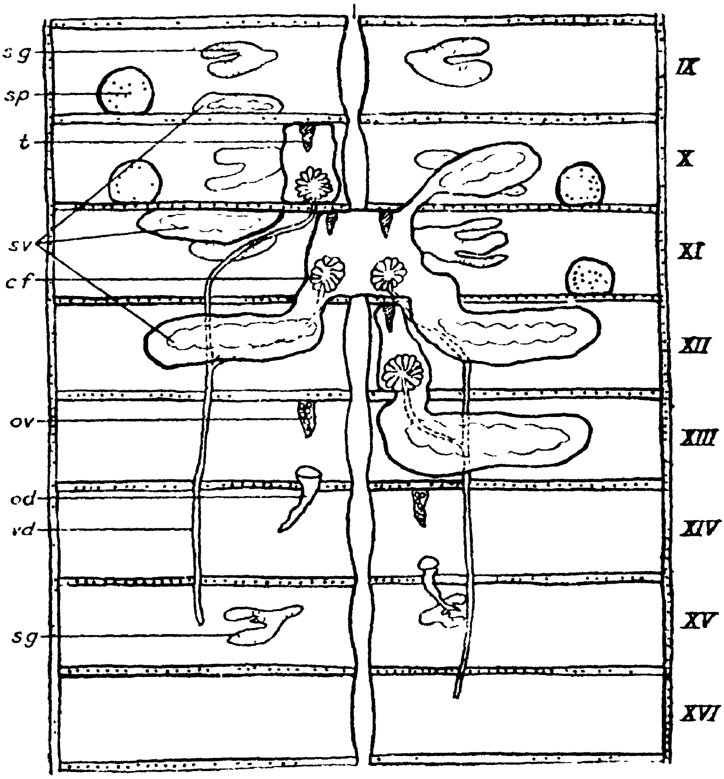
* I have to thank Mr. C. C. A. Monro of the British Museum (Natural History) for information regarding this paper which I was unable to consult myself.

DESCRIPTION.

External Features.—The worm, which turned up in class material, attracted attention by the asymmetry of the male pores, that of the right side being on the 16th segment, whereas the left pore was in the normal position on the 15th segment. On closer examination it was seen that the female pores corresponded in position with the male pores, the right pore being on segment 15 and the left one on segment 14. The clitellum was normal in position. The copulatory papillæ, which are



Lumbricus terrestris; diagram of genital organs of an abnormal specimen, seen from above.

c.f., ciliated funnel; *n.c.*, nerve-cord; *od.*, oviduct; *ov.*, ovary; *s.g.*, setal gland; *sp.*, spermatheca; *sv.*, seminal vesicle; *t.*, testis; *vd.*, vas deferens; IX–XVI, segments nine to sixteen.

usually found developed on segment 26, were very indistinct.

Ovaries.—The ovaries were equally developed on both sides of the body. The right ovary was in segment 14 and the left ovary in segment 13. As far as could be ascertained by means of a dissecting microscope, there were no other ovaries in adjacent segments.

Oviducts.—The oviducts corresponded in position with the ovaries. The oviduct of the right side passed dorsally over a large setal gland, which was situated in segment 15.

Seminal Vesicles.—The seminal vesicles of the right side were normally developed as to size, but were situated in segments 10, 12, and 13. Those of the left side were in the normal segments (9, 11, and 12), but with the exception of the third were much smaller than usual and also smaller than those of the right side. The first seminal vesicle of the left side was in segment 9, and, as far as could be seen by dissection, had no connection with the central reservoir ; it was much smaller than normal and was almost the same size as the spermatheca. The second seminal vesicle of the left side, which was in segment 11, was also smaller than normal, and again no trace of a connection between it and the reservoir could be found. The contents of these two seminal vesicles also point to the fact that at this stage all connection between them and the testes had been lost, the contents being entirely pseudo-navicellæ of *Monocystis*, with few, if any, developing sperms. This is in great contrast to the contents of the third seminal vesicle of this side, which was in connection with the reservoir, and contained many developing sperms, and did not appear to have more than a normal infecton of *Monocystis*.

The Ciliated Funnels and Male Ducts.—The funnels of the right side were situated in segments 11 and 12, the ducts from them joining in segment 13 and opening to the exterior in segment 16. On the left side the funnels were in their normal segments, the ducts joining in segment 12 and opening to the exterior in segment 15. The anterior funnel on the left side appeared to be contained in a portion of the cœlom which had no connection with the seminal vesicles. The anterior testis of this side was attached to the septum between the 9th and 10th segments and also lay in this portion of the cœlom. The remaining testes had the normal relation to the funnels.

Spermathecæ.—These were all present, and those of the right side were situated one segment further back, so as to agree fully with the asymmetry exhibited by the other organs.

Setal Glands.—Very much enlarged setal glands were found on both sides of the body in segments 9, 10, 11, and 12; those in the 12th segment, however, were not as large as the others. Another pair of these glands was found in segment 15, the right gland lying below the right oviduct, as already described.

Remarks.—The asymmetry described above is much more complete than in any other case which has yet been recorded, extending as it does over the whole reproductive system. The only other modification which was noted was that the calciferous glands began and ended one segment further back on the right side than on the left. The nervous system and the nephridia both appear to be quite normal. It is peculiar that the setal glands, which have to do with the penial setæ, and might be regarded as secondary sexual organs, are quite symmetrical in their arrangenent.

One further point has to be mentioned, and that is that the degree of *Monocystis* infection found on the left side of the worm appeared to be, in the first two seminal vesicles, much more intense than usual, and it may be that some of the abnormalities presented by this specimen were due to this parasitized condition. It might be useful if in other cases of abnormal genitalia a note were made of the degree of infection with parasites.

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WOODWARD, M. F. 1892. "Description of an Abnormal Earthworm possessing Seven Pairs of Ovaries." Proc. Zool. Soc. Lond. 1892, pp. 184–188, pl. xiii.

——. 1893. "Further Observations on Variations in the Genitalia of British Earthworms." Proc. Zool. Soc. Lond. 1893, pp. 319–324, pl. xxiv.

XXXI.—*A further Contribution to the Study of South African* Scelionidæ (*Insecta, Hymenoptera, Proctotrupoidea*). By G. E. J. NIXON, B.A.

[Plates X. & XI.]

THE present paper continues the work of the author's last *, the ultimate aim in view being to monograph the Scelionidæ contained in the valuable collections of Hymenoptera made by Mr. Rowland E. Turner in South Africa, and generously presented by him to the British Museum, which previously possessed no material of this family from South Africa.

However, the publication of this paper is accompanied by not a little reluctance on the part of the author, for, in furthering his purpose, he has found the erection of several new genera and the description of many new species inevitable. It is unfortunate that, thereby, yet another load is added to an already overburdened nomenclature, and especially so, since the author cannot confidently believe in the validity of all of the genera which he is bringing forward as new. The reason for such uncertainty lies in the fact that some of these genera are based largely on characters to which apparently no attention has been paid by earlier writers, but which the present author, from his experience of this group of insects, considers to have been likely features of many of the genera previously described. One such character (*i. e.*, "a specialized mesonotal area," referred to below) is possessed by Ashmead's genus *Lapitha*, although its presence is not noted by him.

The use of these characters has greatly facilitated the classification of the South African material, and, so far, it has been possible to assign a definite value to them, but whether this value would hold good if their use were extended to a revision of the present classification of the Scelionidæ as a whole must remain doubtful, as the author has had personal access to only a small collection of described species.

In consideration of the above remarks then, it will not be surprising that the relationships existing between the new genera and species described in the following pages, on the one hand, and those genera and species which are already known, on the other, will have been often inadequately defined.

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* "On some new South African Proctotrupoidea (Scelionidæ)," 'Eos,' vii. pp. 355–382 (1931).

Generic value has, in the main, not been given to secondary sexual characters. The author is of the opinion that, from the point of view of convenience, such characters are best treated as specific. Among the Scelionidæ, many of the females possess a remarkable prolongation on the first abdominal segment. In form and sculpture this prolongation shows peculiarities which are extremely useful in separating species. Apart from its specific value, its mere existence at all would be a highly convenient factor in the establishment of a generic system, were it not for the fact that, in the males associated with any group of females which have this prolongation, no character is present which is not common also to the males of another group of species, which would fall naturally within the same genus, but the females of which are without this prolongation. The same remarks apply equally well to other secondary sexual characters occurring in both sexes of the Scelionidæ.

It follows that, in accordance with the author's conception of a genus, which, it is freely admitted, is determined as often by requirements of convenience as by a due regard for the natural arrangement of a group of species, the males included in one genus will be separable by characters which are no more than specific, while their females will show differences which would appear to be generic. The writer is fully aware that an attitude towards the limiting of a genus, such as would be inferred from what has just been said, is sometimes open to objection, but he does not think that this is so in the case of the Scelionidæ, a group the present classification of which is in a state of great disorder, chiefly because it draws support from the indiscriminate use of secondary sexual characters as a basis for genera.

In fixing the limits of genera, stress has been laid on: (i.) the distance at which the subcostal nervure is situated from the edge of the wing. Such genera as *Gita* and *Govinda* offer an example of either extreme type. (ii.) The presence or absence of a small plate which is situated against the anterior margin of the mesonotum, lying within the angle or curve formed by the posterior margin of the pronotum. So far as the author is aware, neither of the above characters has been made use of by earlier writers in the diagnosis of genera.

With regard to the terminology employed in the descriptions, some confusion might arise out of the use of the word "striation" and its derivatives. A single stria or striation refers always to a ridge or raised line, and not to the intervals between such ridges or raised lines. The author believes that the connotation which he gives to this group of words is unusual, but he defends his particular usage of it on the grounds of convenience.

In describing sculpture, the term "scaly-reticulate" is frequently employed. This expression refers to a sculpture of delicate, often very faint, scratches, forming a fine close network on a normally smooth surface. Where such a type of sculpture predominates, as in the African species of *Paratrimorus*, the surface usually shows also minute well-separated punctures.

All those genera which were dealt with in the writer's previous paper are included in the key to genera below.

The types of all new species described below remain the property of the British Museum.

In conclusion, the author takes this opportunity to express his indebtedness to Dr. Hugh Scott and to Prof. S. Maulik for many helpful suggestions, and to Mr. Engel Terzi for the excellent drawings of wings. The other figures are from drawings by the author.

Key to the Genera.

1. Tergite 2 without a trace of a transverse furrow at its base. Thorax truncate in front, the truncate part being occupied by the pronotum alone; the mesonotum extends forwards between the sides of the pronotum, but not downwards towards the neck, and, in consequence, when seen from the side, is only very weakly arched in front .. *Oriscelio* Kieffer.

Tergite 2 with a transverse furrow or fine groove or at least impression at its base. Thorax not truncate in front, the mesonotum extending downwards towards the neck as well as forwards between the sides of the pronotum and hence, when seen from the side, strongly arched in front .... 2.

2. Frons deeply hollowed out, the resulting cavity reaching to nearly the anterior ocellus and its limits above and at the sides clearly defined by a sharp ridge .. *Hoploteleia* Ashm.

Frons not deeply hollowed out, or if at all excavated, then the resulting cavity is not clearly defined by a ridge 3

3. Scutellum posteriorly produced on each side into two subtriangular tooth-like lamelliform processes, and appearing in consequence emarginate posteriorly. (These processes are often very much reduced.) .... *Shreemana*, gen. nov.

Scutellum posteriorly without lamelliform processes on each side and of normal form .... 4.

4. Mesonotum, right in front, with a more or less distinct, transverse, straight or sinuate ridge, which separates off a small. subtriangular area which lies within the curve or angle formed by the posterior margin of the pronotum (this area might well be taken for a part of the pronotum itself; it is usually smooth and shining) .... 5.

Mesonotum without such an area in front 8

5. Subcostalis not distinctly separated from the edge of the wing, so that the wing-membrane is hardly distinct above it...... .... *Duta*, gen. nov.

Subcostalis well separated from the edge of the wing, so that the wing-membrane is very distinct above it .... 6.

6. Postscutellum medially with a projecting process. Eyes bare.......... 7.

Postscutellum medially without a projecting process. Eyes hairy .... *Gita*, gen. nov.

7. Process of the postscutellum pointed at its apex, triangular or tooth-like. Tergite 3 much longer than 2. Postmarginalis virtually wanting .... *Paratrimorus* Kieffer.

Process of the postscutellum not pointed at its apex, where it is bidentate or has its apical margin straight or slightly emarginate. Tergite 3 hardly longer than 2. Postmarginalis very distinct.. *Vardhana*, gen. nov.

8. Parapsidal furrows entirely or virtually wanting .... 9.

Parapsidal furrows more or less evident. 12.

9. Eyes bare. Middle tergites transversely impressed at their base, so that the abdomen, in lateral aspect, has the appearance of being distinctly notched along its dorsal surface. Marginalis longer than the stigmalis .... *Thelepte* Nixon.

Eyes hairy (the hairs often very short), or if bare, then the middle tergites are not as above. Marginalis shorter than the stigmalis .... 10.

10. Tergite 1 distinctly transverse; tergite 2 by no means twice as wide apically as basally. Postscutellum medially with a horizontal, triangular or semicircular, lamelliform process .... *Govinda*, gen. nov.

Tergite 1 not distinctly transverse; tergite 2 twice or nearly twice as wide apically as basally. If the postscutellum has any process, it is not horizontal .. .. 11.

11. Apex of the propodeum with a short tooth-like process on each side. Postscutellum medially without any process. .... *Procacus* Kieff.

Apex of the propodeum without tooth-like processes. Postscutellum medially with a short, transverse, angular lamelliform process .... *Lapithoides*, gen. nov.

12. Eyes conspicuously hairy............. *Paranteris* Kieffer.

Eyes bare, or at the most with minute, scattered, quite inconspicuous hairs... 13.

13. Marginalis short, considerably shorter than the stigmalis .... *Ceratoteleia* Kieffer.

Marginalis long, at least as long as the stigmalis .... *Macroteleia* Kieffer.

ORISCELIO Kieffer.

Oriscelio Kieffer, Bull. Soc. Ent. France, p. 293 (1912).

According to Kieffer, *Oriscelio* is a genus differing from *Scelio* only in that the scutellum is bilamellate posteriorly. A careful study of the type and one other species reveals that *Oriscelio* is a genus quite distinct from *Scelio*, and one not possessing very obvious affinities with it. It does, however, show a clear relationship with *Sceliomorpha*, or, rather, with certain of the species now placed in this genus, for, in the author's opinion, *Sceliomorpha*, though better defined than most of the other Scelionid genera, contains a number of species whose interrelationships are imperfectly understood.

The following diagnosis of the genus is suggested :—

Head transverse, not strongly produced backwards at the temples and hence not conspicuously emarginate behind. Frons with a large shallow impression, which is bordered above, but not at the sides, by a ridge; the upper margin of this impression is far distant from the anterior ocellus, and when the head is seen from the side the frons appears to project slightly at the point where the ridge defines the upper limits of the frontal impression.

Antennæ 12-segmented in both sexes; club of female funicle distinctly separated from the rest of the funicle, that is, segment 4 is by no means intermediate in size between 3 and 5; first segment of the club about twice as long as the second; funicle of the male very short. Eyes bare. Posterior ocelli almost touching the eye-margin. Mandibles with two teeth of equal length.

Thorax nearly parallel-sided, conspicuously truncate in front; the truncate part is occupied by the pronotum alone, which is necessarily strongly produced upwards in front; the mesonotum extends forwards between the greatly enlarged shoulders of the pronotum, but does not extend downwards towards the neck of the insect; the mesonotum, in consequence, is but weakly arched in front when seen from the side. Shoulders of pronotum large and conspicuous from above. There is no trace of parapsidal furrows. Scutellum with an irregular and often feeble notch at the mid-point of its posterior margin. The postscutellum lies below the level of the scutellum, so that, in lateral aspect, its small process projects only a little beyond the apex of the scutellum. Lateral carinæ of the propodeum much modified; these carinæ are exaggerated and produced into more or less horizontal flaps on each side of the propodeum; the apical lateral corner of each flap is acutely angled, as is also the apical inner corner; the entire margin between the two corners is shallowly emarginate; the two inner angles are connected by a ridge (often indistinct in the middle) which is curved in such a way that the propodeum appears semicircularly hollowed out medially. Legs rather short; segment 1 of the hind tarsus shorter than the following segments together. Fore-wings with the subcostalis well separated from the edge of the wing along its entire length; marginalis punctiform and distinctly separated from the edge of the wing; postmarginalis entirely wanting; a false and feebly indicated radius encloses a long radial cell which is fully three-quarters of the length of the subcostalis; fringe very short and inconspicuous.

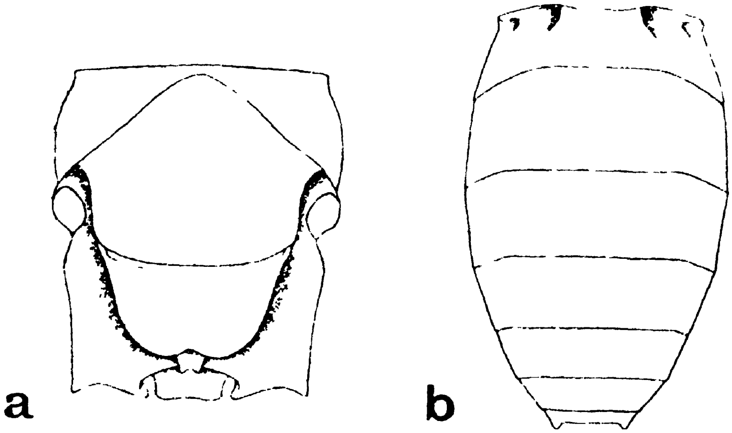
Abdomen not or extending but little beyond the apex of the wings, flattened above. All segments transverse; segment 1 strongly transverse, its basal margin with modifications correlated with those of the propodeum; the sides of the segments at the base are more or less hollowed out and, in consequence, the segment between the two excavations appears raised in the form of a shield, which, being margined at its sides and at its base, is more or less rectangular in outline. The median raised part of the segment would fit into the medial excavation of the propodeum ; the two hollows on each side of the shield would receive the propodeal flaps. Segment 2 without any trace of a transverse groove or furrow at its base ; 3 a little shorter than 2.

Oriscelio turneri, sp. n. (Text-fig. 1.)

Intense black. Antennæ of female (except pedicel and first four segments of the funicle, which are paler) black. Legs in both sexes (except tarsi, which are paler) black.

Head about one and three-quarter times as wide as long. Frontal impression roughly circular to transverse, but always ill defined with regard to its lateral limits; at its sides the impression often has large punctures ; distance between the upper margin of the impression and the anterior ocellus about two-thirds as great as the shortest distance between the eyes on the frons. Surface of the frons between the impression and the anterior ocellus strongly, but somewhat evenly, reticulate-punctate,

Text-fig. 1.



Oriscelio turneri, sp. n., ♂.
a, thorax ; *b*, abdomen.

and highly polished; the pits themselves are rather shallow. Surface in the region of the ocelli irregularly sculptured. The declivous part of the vertex tends to be separated from the ocellar region by a slight change in the nature of the sculpture, the latter showing a marked tendency to develop continuous transverse ridges out of the otherwise reticulate surface; such ridges, though irregular, are especially distinct across the vertex immediately behind the ocelli. Cheeks both anterior and posterior to the genal sulcus very coarsely sculptured. Eyes closely margined by a carina, which is less distinct on the inner margin.

Antennæ: first four segments of the funicle very short and small; 3 and 4 very strongly transverse; 5 to 10 forming a very thick club, which is fully three times as long as the rest of the funicle. Mandibles narrow, strongly curved.

Thorax clothed sparsely with more or less upstanding hairs. Mesonotum coarsely reticulate; the meshes large, the ridges forming them thick: there is no marked tendency for the longitudinal sides of the reticulations to be connected up so as to form straight percurrent ridges over the length of the mesonotum. Scutellum a little more closely reticulate than the mesonotum; notch on the posterior margin shallow and irregular. Postscutellum, medially, with a small, slightly bidentate projection. Propodeal flaps more or less evenly reticulated all over, and with no trace of a longitudinal ridge. Fore-wings brownish, without conspicuous bristle-like hairs on the subcostalis.

Abdomen about one and two-third times as long as wide; segment 1 with its apical width nearly four times as great as its medial length; space within the median area with four or five wrinkled striations; 2 striate-reticulate; following segments becoming gradually less coarsely striate-reticulate than 2, but the sculpture remaining quite distinct and essentially of the same type.

Length about 3·3 mm.

♂.—Antennæ very short; scape about as long as the following four segments together; funicle about one and one-third times as long as the eye, all segments, except 1 and 10, strongly transverse; 3 slightly the widest; the entire funicle is densely clothed with extremely short hairs, which do not however, completely obscure the sculpture of the segments.

Abdomen : segment 7 produced at each apical c[illegible] into a short tooth.

Length 2·8–3·2 mm.

Otherwise like the female.

CAPE PROVINCE (Port St. John, *Feb.–Aug. incl.* ; *Oct.*), 16 ♂♂. 6 ♀♀.

This species is [illegible] easily separated from *O. sey*[illegible]*lensis* Kieffer by its shorter, stouter, form. *O. seychellens*[illegible] ♀♀ (the [illegible] not known) [illegible] men [illegible] narrower, [illegible] species, too, the [illegible] of the mesonotal reticulations tend to connect up to form distinct percurrent ridges over the [illegible] mesonotum ; this tendency is correlated with a fading out of the transverse ridges of the reticulations, thus heightening the longitudinally ridged appearance of the sculpture. The legs also are bright reddish yellow and the entire body is not so intensely black as in *turneri*.

From *Sceliomorpha* Ashm., as understood by Dodd, *Oriscelio* is distinguished by having the truncature of the thorax formed by the pronotum alone.

Sceliomorpha mirella Dodd, a species from Australia, has the thorax conspicuously truncate in front, but the truncature quite definitely involves the anterior part of the mesonotum, which extends down towards the neck.

Oriscelio is distinguished from *Sceliomorpha*, sensu Kieffer, in that it possesses bare eyes and has two teeth to the mandibles instead of three.

Such differing characters as these, with regard to both Dodd's and Kieffer's treatment of *Sceliomorpha*, do not exhaust the differences between this genus and *Oriscelio*, but, since the characters which the author would like to see emphasized are overlooked by Kieffer and not fully dealt with by Dodd, it is impossible to make detailed comparisons.

Oriscelio is chiefly characterized by the shape of the head, position of the frontal impression, formation of the truncature of the thorax, notched scutellum, modified propodeum with corresponding modifications of the first tergite, and complete absence of any impression at the base of tergite 2.

HOPLOTELEIA Ashmead.

Hoploteleia Ashmead, *Bull. U.S. Nat. Mus.* v. 45, p. 227 (1893).

Key to the African Species.

Mesono[illegible] with no [illegible] with large longitudinal [illegible] unpunctured spaces, which are [illegible] except for an extremely fine [illegible] reticulate surface-sculpture. Occipital margin conspicuously angled at the temples .... [illegible] dull

Mesonotum medially with a distinct or indistinct, longitudinal furrow or irregular band of puncture-like reticulations. Scutellum everywhere rugose-punctate or reticulate-punctate. Occipital margin more or less evenly circular throughout .... 2.

2. When the head is seen from above, the distance between the upper margin of the frontal excavation and the occipital margin is about as great as the shortest distance between the eyes across the anterior ocellus. Mesonotum evenly convex. Median groove of the mesonotum usually represented by an irregular band of puncture-like reticulations. Cheeks both anterior and posterior to the genal sulcus conspicuously striated, though the striæ are sometimes irregular. Posterior to the genal sulcus the surface is striated up to about as far as the temples, at which point they sometimes merge into reticulations; the surface between these striations is smooth and shining. The distance between the bases of the mandibles is nearly as great as, or even greater than, the greatest width of the frontal excavation. *dissimilis*, sp. n.

When the head is seen from above, the distance between the upper margin of the frontal excavation and the occipital margin is often considerably, and always distinctly, greater than the shortest distance between the eyes across the anterior ocellus. Mesonotum usually more or less flattened. Median groove of the mesonotum consisting of a row of puncture-like impressions and usually distinct for at least two-thirds of its possible length. Cheeks anterior to the genal sulcus more reticulate than striate, often nearly smooth and shining. Posterior to the genal sulcus, the surface is without conspicuous striations, and against the lower half of the sulcus it tends to become entirely smooth and shining; beyond this smooth area, up to as far as the temples, the surface is irregularly and finely reticulate; the space between the reticulations tends to be dull

	by reason of an extremely fine scaly-reticulate sculpture. Sometimes the raised reticulations are scarcely visible, in which case the scaly-reticulate surface-sculpture is denser. The distance between the bases of the mandibles is only about one-half to two-thirds as great as the greatest width of the frontal excavation	*africana* Dodd.

Females.

1.	Abdomen attenuated apically	*dissimilis*, sp. n.
	Abdomen not at all attenuated apically....	2.
2.	Mesonotum medially, with an indistinct longitudinal carina. Scutellum with large unpunctured spaces, which are smooth except for an extremely fine scaly-reticulate sculpture. Occipital margin conspicuously angled at the temples	*orthopteræ* Dodd.
	Mesonotum medially without a longitudinal carina. Scutellum everywhere rugose-punctate or reticulate-punctate. Occipital margin more or less evenly circular throughout	*africana* Dodd.

H. africana Dodd appears to be common in South Africa. There are in the B.M. collection numerous examples from the Orange Free State (Harrismith) and from Cape Province (Port St. John).

Hoploteleia dissimilis, sp. n. (Text-fig. 2.)

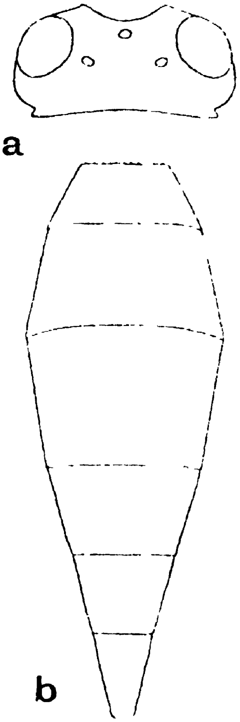
Characters given in the key will be repeated only where amplification is necessary.

♂♀.—Dull black. Antennæ black. Legs vary from nearly all black, through black with the front tibiæ entirely reddish yellow (1 ♂) to entirely red with only the coxæ black and the tarsi infuscated (in the one ♀).

♂.—*Head* transverse, its width fully twice as great as the distance between the frontal excavation and the occipital margin; the ring formed by the occipital margin is large, so that the vertex behind is not strongly declivous and the surface of the head behind the eyes is lateral. The distance between the frontal excavation and the anterior ocellus is about half the distance between the frontal excavation and the eye. Vertex behind the ocelli finely, irregularly, and somewhat indistinctly reticulate; there is no marked tendency for longitudinal ridges to form as in *africana*. Antennæ: funicular segments closely set one into the other; segments 4–9 all a little longer than wide; the entire funicle is densely clothed with extremely short, almost adpressed hairs, which obscure the sculpture of the segments and give the entire funicle a greyish appearance. This funicular pubescence is denser and closer than in *africana*.

Thorax: Mesonotum evenly convex. Parapsidal furrows quite strongly widened posteriorly, consisting of a row of transverse puncture-like impressions. In one male an indistinct median groove is present; on its posterior third the surface of the median lobe is irregularly striate-reticulate or merely reticulate; the surface to the sides of the median sculptural modification and that of the lateral lobes, finely scaly-reticulate, with moderately large, distinct, but often ill-defined punctures, which are fairly close together. In *africana*, these punctures are smaller, much less distinct, and often entirely absent. Scutellum rugose-reticulate and without smooth areas. Postscutellum medially with a small tuberculate process

Text-fig. 2.



***Hoploteleia dissimilis*, sp. n.**
a, head, ♂, from above; *b*, abdomen, ♀.

which is usually distinctly bicarinate. Wings typical for *Hoploteleia*; postmarginalis nearly twice as long as the stigmalis; marginalis punctiform; angle between the stigmalis and the postmarginalis about 50°.

Abdomen about two and a quarter to two and a half times as long as wide, slenderer and more regularly spindle-shaped than in *africana*; segment 1 with a deep transverse impression along its entire basal margin. The striæ, about 6–8 in number, form high ridges where they cross this impression; segment 3 very finely striate-reticulate, the sculpture sometimes so fine as to give the segment the appearance of being dull and finely rugose; 4, 5, and 6 predominantly finely punctured, though the punctures are not sharply defined.

Length about 3·7 mm.

♀.—Antennæ not differing from those of *africana*; funicle gradually thickened to segment 6; the segments very close-set; funicular 1 fully two and a half times as long as its apical width.

Abdomen remarkably elongated, slightly more than three times as long as wide, widest long before the middle, at the junction of segments 2 and 3; from the base of 3 it gradually tapers towards the apex; 4, 5, and 6 together nearly twice as long as 3; 5 hardly shorter than its basal width; 6 longer than its basal width; 4 towards the sides with a sculpture similar to that of 3.

Length 4·4 mm.

NATAL (Van Reenen, Drakensberg, *Dec.–Jan.*), 1 ♀, 4 ♂♂.

In spite of the difficulty of separating the male of this species from that of *africana* by the presence or absence of any one character, the two species are quite distinct. from one another. *H. dissimilis*, sp. n., is a larger insect with an obviously different facies. The most reliable character for distinguishing the males would appear to be provided by the difference in the length of the head as shown by the frontal measurements. The females admit of no confusion whatsoever, and are at once separated by the shape of the abdomen.

SHREEMANA, gen. nov.

Head transverse. Cheeks not strongly produced backwards, the head, in consequence, not conspicuously emarginate behind. Frons feebly concave, with a short, median, longitudinal carina which originates at the antennal insertion. Antennæ 12-segmented in both sexes ; funicle in the male filiform, the segments cylindrical and all longer than wide ; funicle in the female slender, the first segment very long. Eyes virtually bare. Paired ocelli very close to the eye. Mandibles with three teeth.

Thorax not distinctly elongate. Shoulders of the pronotum not conspicuous from above. Mesonotum convex, strongly arched in front, without a specialised area anteriorly. Parapsidal furrows complete, sharply defined, and narrow. Scutellum produced posteriorly on each side into two flat, subtriangular, tooth-like processes ; these processes are sometimes much reduced, but, at any rate, the scutellum is always more or less emarginate posteriorly as the result of their presence. Postscutellum at the most with a medial swelling. Propodeum with an excavation in both sexes ; in the male it is shallow and ill defined ; in the female it is smooth and deeply hollowed out to receive the horn of the first tergite. Fore-wings with the subcostalis well separated from the edge of the wing ; marginalis not much longer than wide ; postmarginalis present ; the fringe extremely short on the apical margin of the wing. Legs slender.

Abdomen spindle-shaped, by no means parallel-sided ; tergite 3 not longer than 2 ; 2 with a transverse impression across its basal margin.

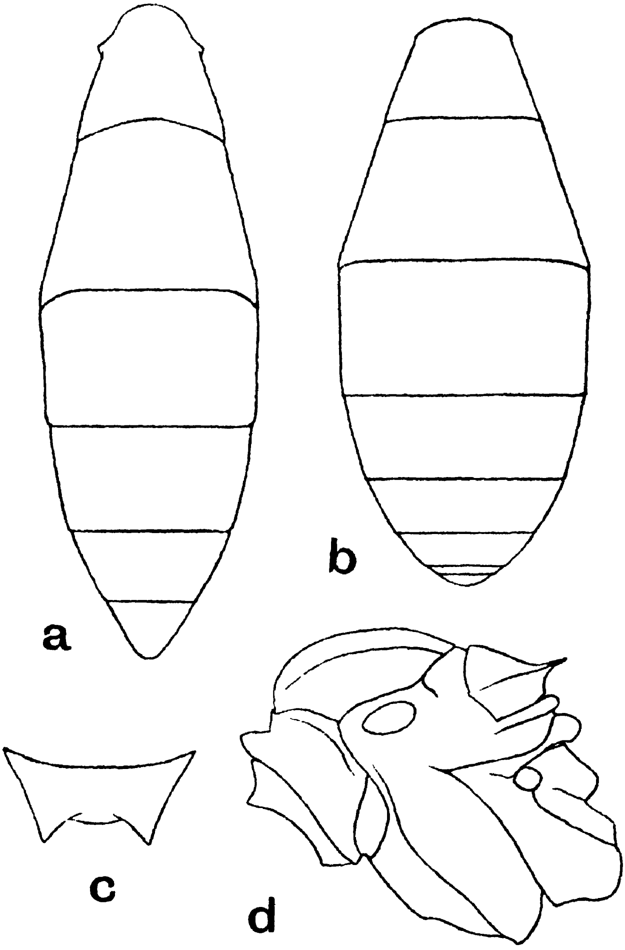
Type of the genus, the following species.

Shreemana sera, sp. n. (Text-fig. 3.)

♂.—Brownish black. Scape of antennæ dirty yellow, the coxæ sometimes darker.

Head transverse, nearly twice as wide as long, dull. Above the antennal insertions there are two small smooth areas separated by a short carina which extends upwards from the antennal prominence to a point about midway between the prominence and the anterior ocellus. The frons otherwise and the vertex above are closely but indistinctly punctured ; the punctures are very small and by no means sharply defined ; they are almost contiguous and the spaces between them are finely sculptured. The general sculpture of the head is characterized as being fine and even. From the apex of the frontal carina there sometimes radiate fan-wise, short, delicate, wrinkly striations. Cheeks between the eyes and the mandibles evenly striated. Shortest distance between the eyes on the frons a little greater than the width of the eyes themselves; the eyes have usually a few scattered, extremely minute hairs which are hardly visible. Posterior ocelli separated from the eye-margin by about their own diameter. Antennæ moderately long;

Text-fig. 3.



Shreemana sera, sp. n.

a, abdomen, ♀; *b*, abdomen, ♂; *c*, scutellum, from above; *d*, thorax, lateral.

scape about three-quarters as long as the following three segments together; segments of the funicle cylindrical, 1 about three times as long as wide; following becoming gradually shorter and thinner, but 8 and 9 still fully twice as long as wide; the entire funicle is clothed with short, almost erect, bristly hairs, which in no way obscure the sculpture of the segments; these hairs are about half as long as the width of the more apical segments; they are evenly placed, so that each one stands out more or less separately. Mandibles with three teeth, the middle one a little smaller than the other two. Clypeus prominent, with acutely pointed lateral angles.

Thorax: Mesonotum dull, punctured more or less like the frons and the upper part of the vertex, the sculpture always fine and even. Scutellum dull like the mesonotum, but its sculpture less definite; punctures are hardly present, at least in the males, and the entire surface appears very finely rugose; processes of the scutellum seen from the side, directed slightly upwards; sometimes these processes are very much reduced, but laterally they are always defined by a sharp edge, and their presence always causes the scutellum to appear more or less emarginate behind. Postscutellum lying much below the level of the scutellum, medially with a slight transverse swelling beneath the normal crenulate furrow; this swelling is usually coarsely punctured. Propodeum with a more or less circular excavation. Fore-wings pale brownish yellow; marginalis about twice as long as wide; postmarginalis somewhat ill defined, but evidently about two or three times as long as the stigmalis; a false radius encloses a long radial cell which is nearly five times as long as wide.

Abdomen shining, a little more than twice as long as wide, slightly more narrowed basally than apically; segment 1 a little longer than its basal width; the longitudinal striations of this segment are strong, very even, and so close together that no flat surface is visible between them, and the grooves between them appear very deep; 2 about one and three-quarter times as wide apically as basally, striated over its greater medial part, but at the sides finely punctured; 3 a little shorter than 2, striate-punctate, the striate element in the sculpture fading out on the apical half or third; 4, 5, and 6 closely and sharply punctured, the spaces between the punctures smooth and shining.

Length about 3·4 mm.

♀.—Shortest distance between the eyes about as great as the width of the eyes themselves. Antennæ slender; scape, pedicel, and first four segments of the funicle brownish yellow; scape slender, but considerably shorter than the following three segments together; pedicel fully twice as long as wide; segment 1 of the funicle very long, about five times as long as its apical width; 2 two-thirds as long as 1; 3 nearly two and a half times as long as wide; 4 distinctly longer than wide, and intermediate in width between 3 and 5; 5–10 forming a weak club.

Abdomen narrow, spindle-shaped, about three times as long as wide; segment 1, in profile, raised at its base and quite strongly produced forwards in the direction of the propodeum; the resulting horn is large and occupies more than half the basal width of the segment; its apex is smooth and shining; further, tergite 1, seen from above, is a little longer than its basal width. In the one female under examination the striate sculpture of segment 3 is much reduced, the greater, medial, part of the tergite being predominantly, irregularly punctured.

Length 3·8 mm.

Otherwise as the male.

Cape Province (Port St. John, *Dec.–Feb.*), 5 ♂♂, 1 ♀.

This interesting species is characterized by the fine sculpture of the head and of the thorax.

Justification for the erection of the genus is found in the peculiar modification of the scutellum, a sclerite, which, in the Scelionidæ, is usually monotonously uniform in structure.

In spite of the obvious morphological differences, the genus *Shreemana* has a clearly recognizable relationship with the genus *Vardhana*. The two genera are alike in that the general shape of the body is the same; both possess a similar type of antennæ and wing-venation, and, in the males, a similar abdominal form.

The same type of head and thorax in the two genera would lead one either to expect a specialized mesonotal area in *Shreemana*, since it occurs in *Vardhana*, or, on the other hand, to wonder why it exists in *Vardhana* at all.

[To be continued.]

THE ANNALS

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MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 70. OCTOBER 1933.

XXXII.—*A further Contribution to the Study of South African* Scelionidæ (*Insecta, Hymenoptera, Proctotrupoidea*). By G. E. J. Nixon, B.A.

[Continued from p. 304.]

The species described below is certainly congeneric, and also possibly conspecific with an insect called *Holoteleia tenuicornis* Dodd from Java. So slight are the differences that the S. African species is entitled to hardly more than subspecific rank.

Dodd's reasons for placing *tenuicornis* in *Holoteleia* must have been a little obscure, for, according to Kieffer's table of genera, *Holoteleia* falls into a section in which the genera possess at the most only feebly developed parapsidal furrows and a punctiform marginalis. On the other hand, the type of *tenuicornis* has complete and well-marked parapsidal furrows and a marginalis which is fully as long as the stigmalis. Since Kieffer does not mention in his diagnosis of *Holoteleia* any of those characters which the author considers to be of paramount importance, it is not proposed to force an unnatural reconciliation between the S. African insect and this genus on account of *tenuicornis* Dodd, but it is proposed, rather, to erect a new genus, *Duta*, to contain *tenuicornis* as the genotype and the new subspecies herewith introduced.

DUTA, gen. nov.

Head transverse. Frons evenly convex. Cheeks not strongly produced backwards. Eyes clothed with very short inconspicuous hairs. Paired ocelli almost touching the eye-margin. Antennæ 12-segmented. Mandibles with three small teeth.

Thorax not markedly elongate and not at all flattened. Shoulders of pronotum hardly visible from above. Mesonotum in front with a specialized area. Parapsidal furrows represented by complete narrow grooves. Postscutellum medially without any trace of a process. Fore wings with the subcostalis not separated from the edge of the wing, more or less confused with it and forming with the marginalis a straight line; marginalis fully as long as the stigmalis; postmarginalis present.

Abdomen strongly narrowed at its base, almost petiolate; tergite 2 at least twice as wide apically as basally; tergite 1 without pit-like impressions on each side at its base; 3 a little longer than 2.

Type of the genus, *Duta tenuicornis* Dodd.

Duta tenuicornis subsp. *fragilis*, subsp. n.

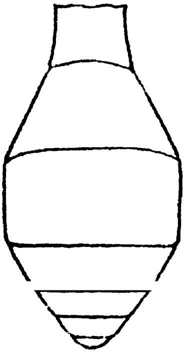
(Text-fig. 4.)

In greater part blackish brown. The legs, tergite 1, the greater part of tergites 2 and 3, honey-brown. Sometimes the propleuræ and the mesonotum are reddish brown, the propleuræ even paler than the mesonotum and providing a slight contrast with the other pleuræ, which are blackish brown.

Head seen from above about twice as wide as long, weakly emarginate behind, and hence, still seen from above, appearing slightly crescent-shaped. Frons up to the anterior ocellus more or less entirely smooth and shining; along the inner eye-margin, there is a tendency for the surface to show faint rugosities. A small area in front of each posterior ocellus is finely rugose; area within the triangle formed by the ocelli more or less smooth and shining; posterior, declivous part of the vertex everywhere and the temples along the posterior eye-margins, very finely rugose. Cheeks before and behind the genal sulcus and the face behind the eyes smooth and shining, and without a trace of striations. Eyes sparsely clothed with very short inconspicuous hairs.

Antennæ: scape as long as the following three segments together; pedicel small and bead-like; funicular segments regularly cylindrical; 1 fully twice as long as wide; following segments to 9 becoming very slightly shorter than 1; 3 with a weak keel extending from its base to within a third of its apex; the entire funicle is thickly clothed with short, pale, semi-erect hairs; these hairs are not regular—that is to say, each hair does not stand out separately; they vary somewhat in length, but are hardly more than one-half to two-thirds the width of the funicular segments. The ocelli are separated from the eye-margin by about their own diameter. The three teeth of the mandibles are more or less of equal length.

Text-fig. 4.



Duta tenuicornis Dodd subsp. *fragilis*, subsp. n., ♂. Abdomen.

Thorax short, thickly clothed with short brownish hairs; these hairs, which are quite conspicuous, are semi-erect and become longer, more erect, and less close on the scutellum. Mesonotum behind, smooth or with very fine scattered punctures, strongly shining, but becoming less so towards the front of the mesonotum, where the surface appears very finely rugulose-punctate, Specialized area of the mesonotum entirely smooth and shining. Parapsidal furrows clearly defined as two narrow grooves. Postscutellum medially, smooth, very polished, and somewhat flattened; this median shining area is in no sense lamelliform. Posterior face of the propodeum shallowly excavated and limited by two very strong ridges, which run from the posterior propodeal corners and almost meet against the mid-point of the posterior margin of the postscutellum; lateral subtriangular areas of the propodeum covered with irregular, more or less coarse, rugosities. Meso- and metapleuræ in greater part smooth and shining. Fore-wings (see Pl. XI. fig. *e*) ample, extending nearly a quarter of their length beyond the apex of the abdomen; owing to the subcostalis being so close to the edge of the wing and forming with the marginalis a straight line the length of the latter is somewhat difficult to determine, but is, nevertheless, fully as long as the stigmalis; postmarginalis a little more than twice as long as the stigmalis; a basalis is faintly indicated; the fringe is long and conspicuous; from the subcostalis, marginalis, and the postmarginalis, spring very distinct, long, bristle-like hairs, many of which are fully as long as the stigmalis. Legs long and slender; segment 1 of the hind tarsus a little shorter than the following segments together.

Abdomen about twice as long as wide, strongly narrowed at its base, almost petiolate; above quite strongly convex, its sides evenly rounded; segment 1 about as long as its basal width; 2 fully two and a half times as wide apically as basally; this segment is smooth and shining, except for close, well-defined, regular striations at its base; usually these striations are restricted to the medial part of the segment, but sometimes they extend over all of its basal two-thirds; 3 transverse, a little longer than 2, entirely smooth and shining; 4, 5, and 6 together, a little shorter than 3, smooth except for some minute scattered punctures, which are most numerous on segment 6.

Length about 1·7 mm.

Cape Province (Port St. John, *Jan.*); Orange Free State (Harrismith, *March*); 7 ♂♂.

The insect is of delicate build, but is not markedly slender; it is characterized by the shining, weakly sculptured mesonotum, a specialized area at the front of the mesonotum, through which character alone it is satisfactorily separated as a genus from *Ceratoteleia*, the narrow, sharply defined parapsidal furrows, the absence of any process on the postscutellum, and the shape and sculpture of the abdomen.

The wing-venation of *Duta* is very similar to that of *Ceratoteleia mellicolor* Nixon and *C. aphrodite*, sp. n. In these two species, however, which are regarded as typical of the genus *Ceratoteleia*, the marginalis is considerably shorter than the stigmalis, and in this respect they differ from *Duta*.

These remarks apply equally well to the genotype *D. tenuicornis* Dodd, which differs from its subspecies only as follows :—

The posterior, declivous part of the vertex is almost smooth ; the median lobe of the mesonotum is less sculptured, and on its posterior half is virtually impunctate. The lateral, subtriangular, areas of the propodeum are predominantly longitudinally striated all over ; the two carinæ meet before reaching the mid-point of the posterior margin of the postscutellum ; the striated lateral areas, in consequence, are connected by a narrow band of similarly striated surface.

Dodd's species was described from both sexes.

GITA, gen. nov.

Head transverse. Frons evenly convex, without any trace of an impression. Cheeks not strongly produced backwards, and hence the head not conspicuously emarginate behind. Eyes clothed with very short hairs. Paired ocelli nearly touching the eye-margin. Antennæ 12-segmented. Mandibles with three teeth.

Thorax somewhat flattened above. Mesonotum with a specialized area in front. Parapsidal furrows present. Scutellum without a lamelliform process. Fore wings with the subcostalis well separated from the edge of the wing ; marginalis about as long as the stigmalis, which is of normal length ; postmarginalis present and considerably longer than the stigmalis.

Abdomen narrow, spindle-shaped, and about twice as long as the thorax ; the first three tergites transverse ; 3 a little longer than 2.

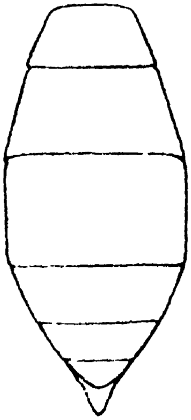
Type of the genus, the following species.

Gita infortunata, sp. n. (Text-fig. 5.)

Head and thorax black. The abdomen very dark brownish-black. Scape of the antennæ, mandibles, and the legs, except the coxæ, more or less brownish-yellow.

Head a little over one and a half times as long as wide, moderately shining, fairly thickly clothed with short pale hairs, which are nearly erect. Frons immediately above the antennal insertions, smooth, and shining, but towards the anterior ocellus the surface has a fine scaly-reticulate sculpture with very small scattered punctures; in the region of the ocelli themselves the surface is likewise scaly-reticulate, but the punctures become more crowded and they are ill defined and small; on the posterior declivous part of the vertex the punctures fade out, leaving only the scaly-reticulate sculpture. On the cheeks the surface becomes entirely smooth and shining, except for indistinct scattered punctures and the faintest traces of striations. Hairs of the eyes very short, but quite conspicuous. Antennæ: scape about as long as the following five segments together; funicle clothed with short, stiff, nearly erect hairs; segment 1 a little longer than wide; 2 not longer than wide; 3 and 4 bead-like; 5–10 forming a thick club. Middle tooth of the mandibles only a little shorter than the other two.

Text-fig. 5.



Ooda infortunata, sp. n., ♀. Abdomen.

Thorax: Mesonotum flattened posteriorly, clothed somewhat sparsely with short, irregular, nearly erect hairs; it is weakly shining, very finely punctate, the punctures small, ill defined, the spaces between them finely scaly-reticulate or appearing to be covered with faint scratches. The specialized area of the mesonotum is clearly defined and strongly polished. Parapsidal furrows sharply defined as narrow grooves. Scutellum much flattened, medianly becoming entirely smooth, but laterally with a sculpture similar to that of the mesonotum. Postscutellum, seen from the side, without any distinct projecting process, and yet, seen from above, it has a very short shield-like outgrowth, which is smooth and shining, but quite inconspicuous. Posterior surface of the propodeum shallowly excavated; this excavation is covered with fine rugosities, the ridges limiting it are high and distinct at the sides, but as they approach the postscutellar outgrowth they fade out and their place is taken by irregular striations; the lateral, subtriangular areas of the propodeum are without coarse sculpture. Fore wings (see Pl. XI. fig. *g*) more or less hyaline, strongly pubescent, the fringe long; marginalis thick, about two-thirds as long as the stigmalis; postmarginalis fully twice as long as the stigmalis; a faint basalis is present; it is distinctly chitinized and is by no means cloudy.

Abdomen shining, about two and a half times as long as wide and rather strongly flattened above; tergite 1 rather more than half as long as its apical width, without any trace of a horn, although the segment at its middle is very slightly swollen; further, this tergite is somewhat finely striated all over, and the striæ are as close as possible; 2 one and a half times as wide apically as basally, about one and a quarter times as long as 1, and delicately striated all over; 3 about one and one-third times as long as 2, very delicately striated; apically these striations fade into faint ripple-like flutings; 4, 5, and 6 shining, almost unsculptured except for a few microscopic punctures; 6 subtriangular, transverse. In the type the 7th tergite projects a little beyond the apex of the 6th, and is slightly constricted before its apex.

Length about 1·9 mm.

Cape Province (Worcester, 27. iii. 1921); 1 ♀.

This genus is closely related to *Ceratoteleia*, from which it is distinguished by its possessing a specialized mesonotal area. In general appearance, too, it is unlike *Ceratoteleia*; this is largely due to its having a simple, unmodified, first tergite, though this feature may well be only specific. On the other hand, the females of *Ceratoteleia* which are known to the writer possess a very conspicuous horn on the first abdominal segment.

Gita infortunata would seem to be characterized, as a species, by the fine sculpture of the head and of the thorax, and by the somewhat flattened appearance of the latter.

PARATRIMORUS Kieffer.

Paratrimorus Kieffer, Ann. Soc. Sci. Bruxelles, xxxii. pp. 117, 146 (1908).

The type of the genus, *P. perplexus* Kieffer, from Europe, would appear to stand somewhat apart from the other species here grouped with it. However, since Kieffer placed his *P. atriceps*, from the Seychelles, in *Paratrimorus*, and since *atriceps* has an obvious and close affinity with the African species described below, it has been thought advisable to accept the genus as Kieffer understood it, though its limits, as defined by him, certainly call for some modification.

The following diagnosis is suggested:—

Head: Frons with an impression which varies in depth, but is usually shallow and is never enclosed by a ridge. Cheeks not strongly produced backwards, hence the head is not conspicuously emarginate behind. Eyes bare or hairy. Posterior ocelli touching or almost touching the eye-margin. Mandibles with three teeth, the middle one sometimes very small (as in the genotype, according to Kieffer), but usually only a little shorter than the other two.

Thorax hardly elongate. Mesonotum with an ill-defined specialized area, the sculpture of which is not very different from the rest of the mesonotum. Parapsidal furrows present or wanting, represented by narrow grooves. Postscutellum medially, with a sharp, triangular process or a simple tooth. Fore wings with the subcostalis well separated from the edge of the wing; marginalis much shorter than the stigmalis; postmarginalis wanting or almost wanting.

Abdomen short and somewhat broad, often much narrowed at its base, the first three segments transverse, the third by far the longest.

The species of *Paratrimorus*, at least as far as the African and the Seychellian species are concerned, are short, dumpy insects of somewhat stout build. They are usually shining and the predominant sculpture of the head and the thorax is one of fine scaly-reticulation. Only *P. pinguis*, sp. n., stands somewhat apart in this respect, but even in this species, in spite of the apparent dulness of the head and the thorax, the essential nature of the sculpture remains the same as in the other species.

Key to the known Species of Paratrimorus.

Females.

1. Eyes hairy .... *perplexus* Kieffer. [(Europe.)
   Eyes bare .... 2.
2. Shortest distance between the eyes on the frons less or only a little more than half the width of the eye itself .... 3.
   Shortest distance between the eyes on the frons greater or hardly less than the entire width of the eye itself .... 4.
3. Mesonotum unpolished, finely rugose, clothed thickly with extremely short hairs; wings usually shortened .... *pinguis*, sp. n.
   Mesonotum polished, with only a faint scaly-reticulate sculpture and without hairs.... *atriceps* Kieffer.
4. Length about 1·9 mm. Tergite 3 distinctly striated over the greater part of its surface. Legs in greater part blackish brown...... *cyclops*, sp. n.
   Length about 1·4 mm. Tergite 3 smooth or with only a faint scaly-reticulate sculpture. Legs almost entirely clear brownish yellow .... *flebilis*, sp. n.

Males.

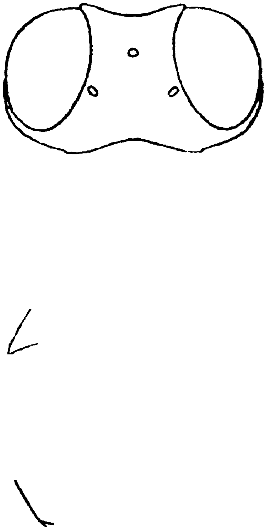
1. Mesonotum unpolished, finely rugose, thickly clothed with extremely short hairs ...... *pinguis*, sp n.
   Mesonotum more or less polished, at the most with a well-defined scaly-reticulate sculpture, and then without a distinct clothing of hairs .... 2.
2. Length about 1·9 mm. Segment 1 of the funicle considerably longer than wide. Tergite 3 distinctly striated all over. Legs in greater part blackish brown ..... *cyclops*, sp. n.
   Length about 1·4 mm. Segment 1 of the funicle only a little longer than wide. Tergite 3 with only a faint scaly-reticulate sculpture. Legs almost entirely clear brownish-yellow.......................... *flebilis*, sp. n.

Paratrimorus pinguis, sp. n. (Text-fig. 6.)

♂.—Black. Antennæ, except club, yellowish-brown. Legs yellowish-brown, the tibiæ and the tarsi often paler, brownish-yellow.

Head somewhat large in proportion to the size of the thorax and a little wider than this, about one and a half times as wide as long. Face above the antennal insertions with a large deep impression; this impression is smooth along its middle, but towards its sides it is unpolished, having a distinct surface-sculpture; when the head is seen from above, the narrow margin between the eyes is seen to be strongly emarginate. Frons above the impression and the vertex in the region of the ocelli hardly shining, unpolished, appearing finely rugose, but under a high magnification extremely closely scaly-reticulate; in addition to this sculpture there are very shallow, irregularly shaped, puncture-like reticulations present, which render the surface slightly uneven; the posterior declivous part of the vertex is smoother and

Text-fig. 6.



Paratrimorus pinguis, sp. n., ♀.
a, head from above; *b*, abdomen.

is either faintly and closely reticulate or has only the fine surface-sculpture. Cheeks shining, striated. Antennæ: scape about as long as the following six segments together; pedicel a little longer and thicker than segment 1 of the funicle; first four segments of the funicle very tiny, together only about half as long as the club; 5–10 forming a thick club which is fully three times as wide as segment 1. Eyes very large, bare; when seen from above they occupy almost the entire lateral surface of the head; the shortest distance between the eyes on the frons is not much more than half the width of the eye itself. Mandibles with three pointed teeth of nearly equal length. Paired ocelli almost touching the eye-margin.

Thorax clothed above with extremely short, but quite distinct, hairs. Mesonotum two-thirds as wide as long, appearing dull, finely rugose; its sculpture is the same as the surface-sculpture of the frons, but is coarser and has no puncture-like reticulations; owing to the lack of the latter, the mesonotum appears smoother than the frons. Parapsidal furrows showing as narrow grooves, which do not quite reach the anterior margin of the mesonotum. Scutellum dull, weakly convex. Post-scutellum medially, with a short, pointed, triangular process; this process is hardly half as long as the scutellum and is not lamelliform. Fore-wings shortened, extending only a little beyond the apex of tergite 2; these vestigial wings are about one and a half times as wide as the scutellum is long.

Abdomen short, ovate, about one and a half times as long as wide; tergite 1 very short, strongly transverse, without any modification at its base, and with sharply defined ridges which are rather wide apart; 2 about one and a half times as long as 1, with strong radiating ridges, which almost reach the apical margin of the segment, and which show no marked tendency to fork at their apex, where they are wide apart and the spaces between them smooth and shining; this segment is about one and a half times as wide at its apex as at its base; 3 transverse, a little longer than the two preceding segments together, weakly shining, and with a strong scaly-reticulate surface-sculpture; this segment is virtually without striation, only along the extreme basal margin are there sometimes faint indications of striations;

4, 5, and 6 together about as long as 3, with a surface-sculpture finer than that of 3; 6 very short, strongly transverse.

Length 1·8 mm.

♂ differs from the female as follows:—

Head slightly less long. Eyes less large, shortest distance between them but little less than the width of the eye itself. Antennæ ranging in colour from blackish-brown, with the scape paler, to entirely yellowish-brown; the scape is only a little shorter than the following six segments together; the funicle is weakly clavate; segment 1 very small, bead-like, hardly longer than 2; 2 and 3 bead-like, a little wider than 1; 5–9 weakly transverse, all distinctly wider than 1, and a little wider than 2 and 3; the funicle is clothed with extremely short, inconspicuous, semi-erect hairs.

Thorax: Fore-wings very distinctly and roughly hairy, the fringe somewhat long, and quite distinct on the upper wing-margin beyond the marginalis; the wings usually reach the apex of the abdomen, but in some specimens they do not extend beyond the apex of tergite 5; subcostalis distinctly separated from the edge of the wing; marginalis thick, about one and a half times as long as wide; postmarginalis wanting.

Abdomen. Tergite 3 not longer than 1 and 2 together.

Length 1·7–1·9 mm.

CAPE PROVINCE (Port St. John, *Dec.*, *Jan.*, *Feb.*); 11 ♀♀, 16 ♂♂.

This species is characterised in both sexes by the dull, unpolished appearance of the head and thorax, and in the male, further, by the distinctly clavate funicle. The shortened wings of the female appears to be a constant character when restricted to the species as it occurs in Port St. John.

A male from S.W. Zululand (Spadeni Kop, *May*) has the antennæ entirely pale brownish-yellow.

A single female from Cape Province (Transkei, Umtata) (*Feb.–March*) differs from typical specimens as follows:—

Fore-wings fully developed, reaching to the end of the abdomen; the venation is similar to that described above for the male. Tergite 2 with distinct short ridges between the longer radiating ridges on the apical half of the tergite. Tergite 3 with fine distinct striations medially which are visible over about two-thirds the length of the segment.

This insect is not considered as at all abnormal, but as being doubtless typical of the species as it occurs in the Transkei district.

Paratrimorus atriceps Kieffer.

Paratrimorus atriceps Kieffer, Bull. Soc. Ent. France, p. 294 (1910).

The type of the species in the collection of the British Museum. It is very closely related to *P. flebilis*, both in general facies and in sculpture, but is at once separated from the latter insect by the much larger eyes and the consequently narrower space between the eyes on the frons.

Paratrimorus cyclops, sp. n.

♀.—Black. Antennæ nearly black; the scape and the first few segments of the funicle brownish-black. Legs blackish-brown the tarsi paler. The entire insect is shining and more or less glabrous.

Head strongly transverse, about twice as wide as long. Frons above the antennal insertions with a shallow impression which is about two-thirds the length of the scape. Frons and vertex shining, more or less polished, with a fine scaly-reticulate sculpture, and with scattered punctures which are quite inconspicuous. Cheeks with some very faint striations. Antennæ: segment 1 of the funicle distinctly longer than wide; 2, 3, and 4 transverse; 5–10 forming a club which is about three times as wide as segment 1. Eyes not large; distance between them a little greater than their width; when the head is viewed from above, the eyes occupy its entire lateral surface—that is to say, the temples behind the eyes form part of the posterior surface of the head. Posterior ocelli separated from the eye-margin by about half their diameter. Mandibles with three teeth of about equal length.

Thorax a little narrower than the head, its sculpture similar to that of the head. Parapsidal furrows narrow, sharply defined, not reaching the anterior margin of the mesonotum, from which margin they are separated by a distance equal to about one-third of their length. Scutellum separated from the mesonotum by a very distinct crenate furrow. Postscutellum medially with a sharp, triangular tooth on its posterior margin.

Propodeum with irregular longitudinal ridges and with indications of a transverse semicircular carina ; on each side of the propodeum there is a tuft of silvery-white hairs. Fore wings extending slightly beyond the apex of the abdomen, extremely finely pubescent, the fringe very short and inconspicuous ; the upper wing-edge beyond the marginalis is without a distinct fringe of hairs ; venation similar to that described for the male of *pinguis*, sp. n.

Abdomen oval, very shining, nearly twice as long as wide ; tergite 1 strongly transverse, about twice as wide basally as its medial length ; this segment is without any modification, and has longitudinal ridges which are rather wide apart ; 2 strongly transverse, nearly twice as long as 1 and about one and three-quarter times as wide apically as basally ; this segment has strong radiating ridges which almost reach the apical margin of the tergite ; the ridges, at least on the middle part of the segment, may be wide apart, the spaces between them more or less smooth, or all the ridges may appear forked, so that the whole segment is closely striated ; 3 with an indefinite scaly-reticulate sculpture and weakly striated all over ; the striæ tend to fade out in the middle of the tergite ; 4, 5, and 6 with only a faint scaly-reticulate sculpture ; 6 strongly transverse.

Length 1·9 mm.

♂ differs from the ♀ only as follows :—

Antennæ brownish-black ; scape a little shorter than the following four segments together ; pedicel about as long as segment 2 of the funicle ; funicle 1 about one and three-quarter times as long as wide ; 2–9 all distinctly longer than wide ; the more apical segments become very slightly thicker than 1 ; the entire funicle is densely clothed with nearly erect, stiff, bristling hairs ; these hairs are conspicuous, very regular, and fully as long as half the width of the funicular segments.

Fore-wings extending well beyond the apex of the abdomen.

Length 1·9 mm.

Cape Province (Mossel Bay, *April & Aug.*), 3 ♀♀, 1 ♂.

Paratrimorus flebilis, sp. n.

This species is closely related to *cyclops*, sp. n., from which it differs as follows :—

♀.—Colour not such a deep black, the abdomen often brownish-black. Antennæ with the scape, pedicel, and the first four segments of the funicle brownish-yellow. The legs, except sometimes the coxæ, clear brownish-yellow.

Head slightly less transverse, in the region of the temples often with scattered adpressed hairs.

Thorax : Mesonotum more shining, the scaly-reticulate sculpture fainter in two females, but quite strong in the other. Parapsidal furrows absent or weakly indicated. Postscutellar tooth very short and sharp. Fore-wings with a moderately long fringe, which is distinct on the upper edge of the wing beyond the marginalis.

Abdomen much more strongly narrowed at its base, appearing almost petiolate ; segment 1 about one and two-thirds as wide basally as its medial length ; in one female this tergite is distinctly swollen in the middle, so that the tergite there appears to have a small hump, which is more or less smooth ; in one other female there is the faintest indication of a swelling, but the striations are everywhere distinct ; tergite 2 about twice as wide apically as basally, with close, regular striations, which do not nearly reach the apex of the segment, and leave, in consequence, along its apical margin, a conspicuous shining band, which in two of the females becomes wider laterally ; 3 almost entirely smooth in one female, in another with a distinct, though faint, scaly-reticulate sculpture, in the third female with a definite scaly-reticulate sculpture, which shows a slight tendency to develop into a striate sculpture.

Length about 1·4 mm.

♂.—The scaly-reticulate sculpture is sharper than in the female ; a male from Somerset East has it conspicuously strong, the insect appearing less shining in consequence.

Head : Antennæ shorter than in *cyclops*, approximating in structure more closely to those of *pinguis*, but with a less distinctly clavate funicle than in that species ; they are brown or yellowish-brown, the scape paler, yellowish; pedicel about equal in size to funicle 1; funicle 1 only a little longer than wide; 2 and 3 bead-like; 4–9 slightly transverse and a little thicker than 1; the entire funicle is densely clothed with nearly erect, stiff, hairs; these hairs are conspicuous, and their length is considerably greater than half the width of the segments, and in proportion to these they appear longer than in *cyclops*.

Thorax: Fore-wings with the fringe conspicuously longer than in *cyclops*, and quite distinct on the upper wing-edge beyond the marginalis.

Length about 1·4 mm.

CAPE PROVINCE (Port St. John, *May*, 1 ♀; Somerset East, *Sept.*, 1 ♂; Transkei, *Feb.*, 1 ♂). ZULULAND (Eshowe, *May*, 1 ♀). NATAL (Van Reenen, Drakensberg, *Jan.*, 1 ♀, 2 ♂♂). The female from Natal shows the strongest sculpture and approaches the most closely in structural details to *cyclops*.

The writer realizes that a description such as the above is far from satisfactory, but he is also of the opinion that to define the limits of a species on such scanty material would be imprudent.

VARDHANA, gen. nov.

Head transverse. Cheeks not strongly produced backwards, the head in consequence not conspicuously emarginate behind. Frons feebly concave, with a median longitudinal carina which originates at the antennal insertions. Antennæ 12-segmented in both sexes; funicle in the male filiform, the segments cylindrical and all longer than wide; funicle in the female somewhat slender, the first segment much longer than wide. Eyes bare. Paired ocelli almost touching the eye-margin. Mandibles with three teeth, the middle one considerably shorter than the other two.

Thorax not distinctly elongate. Shoulders of the pronotum not conspicuous from above. Mesonotum convex, strongly arched in front, and possessing anteriorly a specialized area; this area is entirely smooth, the ridge bounding it posteriorly, bisinuate. Parapsidal furrows indefinitely indicated posteriorly. Scutellum normal, transverse. Postscutellum with a projecting process which is not more than half the length of the scutellum; this process is more or less bidentate at its apex and is directed slightly upwards. Propodeum with an excavation in both sexes ; it is ill defined in the male, and is bounded by two irregular carinæ : in the female it is smooth, and is deepened to receive the horn of the first tergite. Fore-wings with the subcostalis well separated from the edge of the wing : marginalis more or less punctiform ; postmarginalis much longer than the stigmalis ; the fringe is more or less absent, except on the lower part of the wing where it is short and inconspicuous. Legs slender.

Abdomen oval, the tergites all strongly transverse ; 2 about as long as 3, and with a distinct transverse impression across its basal margin. Apical segments with a strong punctate sculpture.

Type of the genus, the following species.

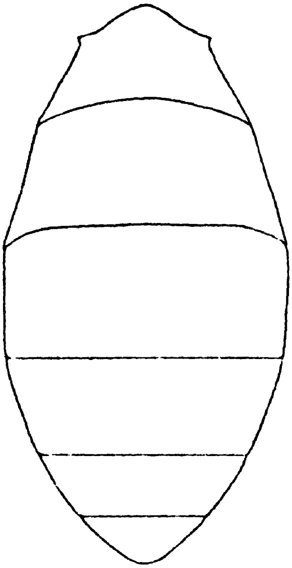
Vardhana selene, sp. n. (Text-fig. 7.)

♂♀.—Very dark brown, almost black. Sides and ventral surface of the thorax dark reddish-brown. Antennal scape in greater part, first three funicular segments, coxæ, femora, and the tibiæ, bright transparent ochreous-yellow ; sometimes the coxæ are whitish yellow ; the tarsi tend to become darker and are more opaque than the rest of the legs.

♀.—*Head* about one and three-quarter times as wide as long, strongly shining and almost glabrous. Frons with a carina which extends upwards from the antennal insertions to a point usually about midway between the antennal insertions and the anterior ocellus ; often it fades out long before. On each side of this carina there is a very shallow, smooth, narrow impression. Frons otherwise and the vertex above, strongly striate-reticulate ; along the inner eye-margins, the surface is often only strongly punctured. Striæ between the mandibles and the cheeks even. Face behind the eyes striate-reticulate, except for a narrow, almost smooth, area which extends from the base of the mandibles upwards against the occipital margin to a point about level with the middle of the eye. Antennæ long and somewhat slender ; scape nearly as long as the eye and a little shorter than the following three segments together ; pedicel nearly two and a half times as long as wide ; segment 1 of the funicle very long, about twice as long as the pedicel ; 2 considerably shorter than 1, but fully twice as long as wide; 3 and 4 about as long as wide; 5–10 forming a somewhat slender club, which is hardly twice as wide as the apex of segment 1. Eyes large, their width a little greater than the shortest distance between them on the vertex.

Thorax shining, not distinctly elongate. Mesonotum evenly convex, its sculpture different from that of the frons; in greater part, it is closely and strongly punctured, the punctures somewhat small and almost contiguous; posteriorly these punctures become slightly larger and here the surface often shows a tendency to become slightly striate-punctate. Parapsidal furrows usually visible posteriorly as smooth, shallow, irregularly shaped impressions which narrow and fade out at about the middle of the mesonotum; the lateral lobes of the mesonotum, where they are defined posteriorly by the parapsidal furrows, are shining and nearly smooth with a more or less even row of large punctures, which runs along the side of the parapsidal furrows. Scutellum punctured more or less like the median part of the mesonotum. The apical margin of the postscutellar process varies from being entire to quite strongly emarginate, so that

Text-fig. 7.



Vardhana selene, sp n., ♀. Abdomen.

it is usually more or less bidentate; further this process is longitudinally striated, the striæ tending to diverge towards each apical lateral angle or tooth. Fore-wings (see Pl. X. fig. *a*) strongly brownish, extending a little beyond the apex of the abdomen, fully as wide as the abdomen; postmarginalis about three times as long as the stigmalis; a false radius encloses a long, feebly defined radial cell. Legs slender, with segment 1 of the hind tarsus about as long as the following segments together.

Abdomen regularly spindle-shaped, about twice as long as wide; segment 1 transverse, its apical width almost twice as long as its medial length; at its base it is strongly raised, the raised part developed into a short blunt horn, which, when seen from the side, is not higher than the level of the rest of the segment; the medial striations of segment 1 are even and not very close together; those at the sides are somewhat wrinkled; 2 about one and a quarter times as wide apically as basally; this segment is irregularly striated all over; except where they cross the basal impression, the striæ are all somewhat wrinkled; towards the sides there is a tendency for the surface to become striate-reticulate; 3 strongly transverse, hardly longer than 2, very closely and regularly striate-punctate; following segments together about one and a half times as long as 2, their surface somewhat dull, closely and strongly punctured; the dull surface is largely due to the presence of a very fine surface-sculpture between the punctures; 5 at the sides tends to become striate-punctate, but on 5 and 6 the sculpture is predominantly punctate.

♂.—*Head* more distinctly hairy than in the female. Eyes not so large, their width hardly greater than the shortest distance between them on the vertex. Antennæ short, pale yellowish-brown, the scape in greater part yellowish; scape shorter than the following three segments together; segment 1 of the funicle about two and a quarter times as long as wide; 2 as long as 1; following segments to 9 becoming gradually shorter, but 8 and 9 still distinctly longer than wide; the entire funicle is clothed with extremely short, more or less erect, bristling hairs; these hairs do not obscure the slightly shining surface of the segments, and there are no adpressed hairs among them. Propodeum with an ill-defined, median excavation; each ridge limiting the upper lateral areas of the propodeum extends inwards from the upper posterior corner of the propodeum and describes a usually distinct, acute, but irregular angle before reaching the postscutellar margin; these two ridges are quite far apart at their junction with the postscutellar margin; each of the upper lateral areas is usually traversed by a more or less distinct carina. Abdomen with tergite 1 transverse, about as long as its basal width, and with two indistinct impressions on each side at its base. The striations of this tergite are rather wide apart.

Length: ♂♀ about 3·5 mm.

CAPE PROVINCE (Port St. John, *Nov.–Dec.*, *Jan.–April*), 13 ♂♂, 11 ♀♀.

A single male from C.P. (Mossel Bay) has the head beneath, the pro- and mesonotum and all the pleuræ, reddish-brown. The antennal scape is dark brown. The legs are more or less the same colour as the lighter parts of the thorax. Details of sculpture agree with those described for the Port St. John specimens except that the punctures of the mesonotum are not quite so close together. The median, oval, area of the scutellum is nearly smooth, and whatever punctures there are are small and placed far apart.

A male from Natal (Van Reenen) has the body and the antennæ entirely black with the legs reddish-brown, the femora darker, the coxæ nearly black. In all other respects the insect resembles the Port St. John material.

As the writer considers that there is no justification for excluding the two above-mentioned individuals from the limits of colour-variation peculiar to *V. selene*, sp. n., it follows that colour can have only a problematical value in the characterization of this species. Certainly the yellow legs of the Port St. John specimens are a striking feature, but the lack of material from other localities does not admit of any conclusions being drawn as to the range of this form.

The species is at once characterized by the contrast provided by the striate-reticulate sculpture of the head and the finer, punctate sculpture of the mesonotum, the genus, by the presence of a specialized mesonotal area, the postscutellar process, and the venation.

[To be continued.]

XXXIII.—*On the Nematode Genus* Proleptus. By H. A. Baylis, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

The genus *Proleptus* Dujardin, 1845, is not yet at all well known. It is proposed in this paper to review briefly what is known of the various species which have been or may be attributed to it, adding a description of one new species and some account of another species (*P. robustus*) which has never been adequately described.

1. *Proleptus acutus* Dujardin, 1845.

Syn. ? *Spiroptera dacnodes* Creplin, 1851 ; ? *Histiocephalus dacnodes* Molin, 1860 ; ? *Spiropterina dacnodes* Diesing, 1861.

Of this species, which is regarded as the genotype, the original description is very brief and was based on a single male specimen. No more recent description of it appears to exist. The host from which Dujardin recorded it was *Raja clavata.*

For measurements see table below (p. 333).

2. *Proleptus obtusus* Dujardin, 1845.

Syn. *Coronilla scillicola* v. Beneden, 1871 ; *Spiropterina scillicola* v. Linstow, 1901 ; *Proeptus scillicola* Lloyd, 1920 ; ? *Spiropterina coronata* v. Beneden, 1858 (*vide infra*).

This is the only well-known species of the genus. Detailed accounts of it have been given by v. Linstow (1901), Seurat (1919), Lloyd (1920) and Müller (1925). It is very common in the stomach and intestine of dogfish (*Scyllium catulus*, *S. canicula*) round the British coasts and elsewhere. Every specimen of these two species examined by the writer at Plymouth was more or less heavily infested. *P. obtusus* has been recorded by Taylor (1925) from *Acanthias vulgaris* off Ceylon and from some South African host. Among the collection of Nematodes belonging to the School of Public Health and Tropical Medicine, Sydney, N.S.W., the writer has also found two sets of specimens of this species, collected off South Africa by Dr. H. P. Bayon. One of these came from a " mole-shark " [? *Rhinobatus*], the other from a " shark " off Robben Island. The latter specimens are of exceptionally large size, the females measuring up to 69 mm. in length, but otherwise there seems to be nothing to distinguish them from European examples.

Lloyd (1920) points out that there is great variation in this species, not only in the actual measurements of individuals but in the proportions of different parts. Some of the measurements given in the recent descriptions are summarized in the table below. A very characteristic feature of *P. obtusus* is the shape of the right spicule, the tip of which is bent towards the left, almost at right angles to the main shaft. This has been more or less clearly shown in some of the existing figures, but Müller (1925) is almost the only author who has accurately described it.

3. *Proleptus inflatus* (v. Linstow, 1890).

Syn. *Spiropterina inflata* v. Linstow, 1890.

This species, which is recorded from *Scyllium immoratum*, differs from *P. obtusus*, but rather closely resembles *P. acutus* (according to Dujardin's description), in the length of the spicules of the male. The size of the worms, however, as given by v. Linstow, is nearly three times that of *P. acutus*.

For measurements see table below.

4. *Proleptus africanus* (v. Linstow, 1899).

Syn. *Spiropterina africana* v. Linstow, 1899.

This form, recorded from *Anguilla* sp. in South Africa, may be provisionally referred to *Proleptus*. It differs from any of the other known species in the lengths of the spicules of the male.

For measurements see table below.

5. *Proleptus robustus* (v. Beneden, 1871) Seurat, 1916.

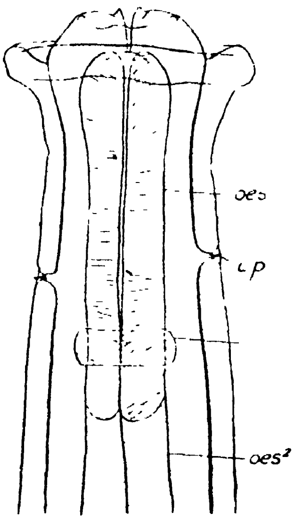
Syn. *Coronilla robusta* v. Beneden, 1871; *Spiropterina robusta* v. Linstow, 1903; ? *Coronilla minuta* v. Beneden, 1871 (*vide infra*).

This worm was recorded by v. Beneden from *Raja circularis* and *R. clavata*. He did not describe it, but gave some figures from which it appears possible to recognize the species. During a short stay at the laboratory of the Marine Biological Association at Plymouth in May 1932 the writer had the good fortune on three occasions to find examples of a species of *Proleptus* in the stomach of *Raja clavata* which, on comparison with v. Beneden's figures, are considered to belong to this species. Further, a few specimens obtained by Mr. L. A.

Harvey from *Mustelus lævis* at Plymouth, and previously recorded by the writer (1928) as *P. obtusus*, prove to be of the same species. They are, however, considerably smaller than the specimens from *Raja*, and are not quite mature.

Among the specimens from *Raja*, most of which are immature, there are one mature male and two mature females, but only the larger of these contains fully-formed eggs. The male measures about 33 mm. in length and 0·65 mm. in maximum thickness. The two females measure respectively about 40 and 44 mm. in length and 0·83 and 0·97 mm. in maximum thickness. The cuticular striations are about 4 μ apart. The anterior end (fig. 1) is surrounded by a well-developed cuticular inflation. The lips are large and rounded, and each bears on its inner surface a single conical tooth. The anterior portion of the œsophagus is 0·6–0·65 mm. in length (measured from the cephalic extremity). The entire œsophagus, measured from the same point, is 6–6·7 mm. long. The cervical papillæ, which are pointed and bristle-like, and contained in small depressions in

Fig. 1.

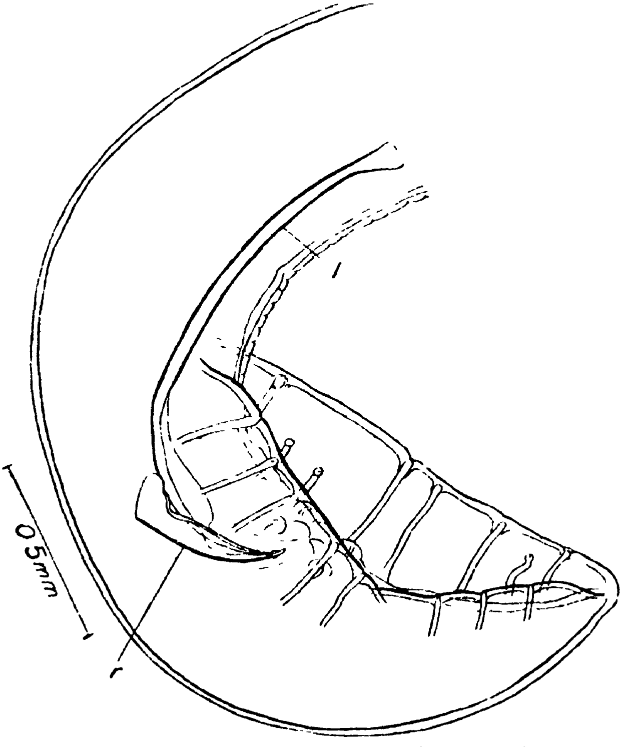


Proleptus robustus. Anterior end of female; dorsal view. *c.p.*, cervical papillæ; *n.r.*, nerve-ring; *oes.*[1], *oes.*[2], anterior and posterior portions of the œsophagus.

the cuticle, are situated at 0·39–0·45 mm. from the anterior end. The nerve-ring is situated at 0·42–0·5 mm., and the excretory pore at 0·85–0·9 mm., from the cephalic extremity.

The caudal end of the male (fig. 2) is curled ventrally. The tail is about 0·8 mm. long. The caudal alæ are very broad and give the posterior end a spoon-like shape.

Fig. 2.

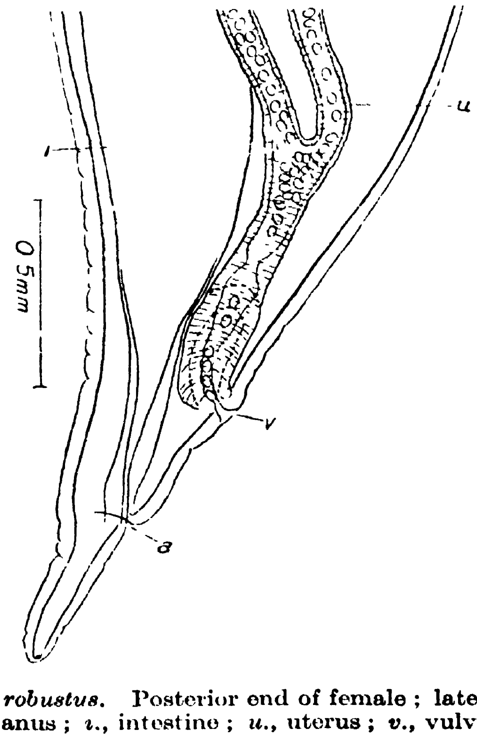


Proleptus robustus. Posterior end of male; lateral view. *l.*, left spicule; *r.*, right spicule.

They contain eight pairs of rib-like papillæ, three of which are preanal and five postanal. Two pairs of subventral papillæ are also present, one just behind and one just in front of the cloacal aperture. The right spicule is broad at its base and tapers rapidly towards the tip, which has a hyaline cap. It measures about 0·4 mm. in length. The left spicule is 1·5 mm. long, and has a tubular shaft and a membranous ala which appears to widen considerably and narrow again rather suddenly a little before the tip. The cuticle of the ventral surface in the caudal region is tessellated.

The caudal end of the female (fig. 3) is curved towards the dorsal side. The tail is rather blunt and measures 0·42–0·44 mm. in length. It bears a pair of subterminal papillæ. The vulva is situated near the posterior end, in the larger specimen at 0·36 mm. and in the smaller at 0·5 mm. from the anus. The vagina, together with the common trunk of the uterus, is very short (0·55-0·7 mm.), and there is a muscular ovejector immediately before the vulva. The two uterine branches run forward parallel to each other. The eggs are roundish-ovoid, measure on the average about 0·045×0·032 mm., and contain coiled embryos when ready for laying. The egg-shell is relatively very thick (about 6 μ).

Fig. 3.



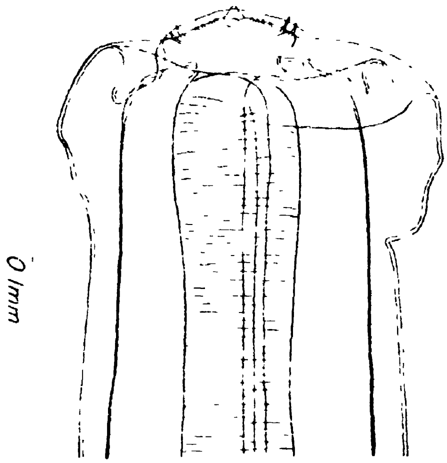
Proleptus robustus. Posterior end of female ; lateral view. *a.*, anus ; *i.*, intestine ; *u.*, uterus ; *v.*, vulva.

6. *Proleptus australis*, sp. n.

The helminthological collection of the School of Public Health and Tropical Medicine, Sydney, N.S.W., includes some specimens of *Proleptus* from the intestine of a "tiger-shark" (probably *Galeocerdo tigrinus*). These were obtained off the Flinders Islands, North Queensland, by Mr. Bassett-Hull, and appear to represent a new species.

The male measures approximately 14–16 mm. in length and 0·46–0·48 mm. in maximum thickness, the female about 18·5 mm. and 0·75 mm. respectively. The cuticular striations are at intervals of about 4·5 μ. The anterior end (fig. 4) is, as usual, surrounded by a cuticular inflation. Each lip, in addition to the usual median lateral tooth, bears on its inner surface two pairs of rather long, spine-like teeth, situated subdorsally and subventrally, and between these and the median tooth a few small denticles. The anterior portion of the œsophagus, measured from the extremity of the head, is about 0·5–0·6 mm. long in the male and 0·65 mm. in the female. The entire œsophagus, measured from the same point, is 2·4–2·7 mm. long in the male and 3·4 mm. in the female. The nerve-ring is situated at 0·33–0·38 mm.,

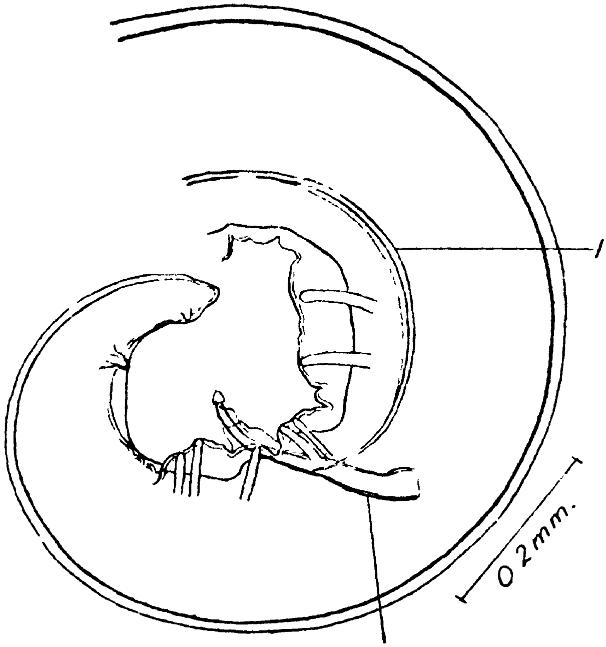
Fig. 4.



Proleptus australis. Anterior end of male; lateral view.

and the excretory pore at 0·54–0·6 mm., from the anterior extremity. The cervical papillæ are at about the level of the nerve-ring or immediately behind it.

The caudal end of the male (fig. 5) is spirally coiled, and its ventral cuticle is tessellated. The tail is about 0·55 mm. long. The caudal alæ are only moderately developed. Nine pairs of papillæ project into them. Of these the anterior seven are long and rib-like, and four are preanal. The edges of the cloacal aperture appear to be produced for some little distance as a delicate membranous tube, through which the spicules may be protruded. The right spicule is relatively stout, measures 0·26–0·27 mm. in length, and has a hyaline cap at the tip. Just before the tip the abrupt termination of a membranous ala sometimes produces the appearance of a



Proleptus australis. Posterior end of male ; lateral view.
l., left spicule ; *r.*, right spicule.

lateral barb. The left spicule is slender and about 1·2 mm. long. It has a rather narrow ala.

The caudal end of the female is curled towards the dorsal side. The tail is blunt and about 0·4 mm. long. The vulva is situated exceptionally far forward, at 8·2 mm. from the posterior end. It opens on the posterior surface of a rounded prominence which appears to be caused by the muscular ovejector. The vagina runs posteriorly from the vulva, and after a course of only 0·15 mm. gives off the two uterine branches, which at first run parallel posteriorly. The eggs are of very uniform size, measuring about 0·038 mm. × 0·027 mm. Their shells are relatively very thick (about 4·5 μ), and they contain coiled embryos when ready for laying.

Co-type specimens of this species will be deposited in the British Museum (Natural History) as well as in the Sydney collection.

7. *Proleptus coronatus* (v. Beneden, 1858).

Syn. *Spiropterina coronata* v. Beneden, 1858.

This species is recorded from *Scyllium canicula* and *Raja radians*. The male, according to van Beneden's description, is 25–30 mm. long, the female 60–65 mm. No other measurements are given, and the worm is not figured. It seems possible that this may be a synonym of *P. obtusus*.

8. *Proleptus* (?) *minutus* (v. Beneden, 1871).

Syn. *Coronilla minuta* v. Beneden, 1871.

This form is recorded by v. Beneden from *Raja rubus* and *R. clavata*, but no description of it is given. Possibly it may be a synonym of *P. robustus*.

9. *Proleptus elegans* (Örley, 1885).

Syn. *Spiropterina elegans* Örley, 1885.

The host from which this species is recorded is *Hexanchus griseus*. The length of the worms, according to Örley's description, is 15–20 mm. in both sexes. The description appears to contain no other characters of specific value except the statement that the male has five pairs of rib-like preanal papillæ.

	P. acutus.	*P. obtusus.*		*P. inflatus.*		*P. africanus.*		*P. robustus.*		*P. australis.*	
Describer..........	Dujardin, 1845.	v. Linstow, 1901 ; Seurat, 1919 ; Lloyd, 1920.		v. Linstow, 1890.		v. Linstow, 1899.		Baylis (present paper).		Baylis (present paper).	
	♂.	♂.	♀.	♂.	♀.	♂.	♀.	♂.	♀.	♂.	♀.
Length	12	31·73–38	32·17–59	35·5	39·7–57	19·7	23·3	33	40–44	14–16	18·5
Thickness (max.)	0·25	0·54–0·55	0·73–0·91	0·54	0·54–0·6	0·51	0·71	0·65	0·83–0·97	0·46–0·48	0·75
Ant. end to end of œsophagus.	—	3·6–4·79 [4·9]	3·69–6·9	[5·07]	[7·4]	[3·18]	[4]	6–6·7		2·4–2·7	3·4
Ant. end to nerve-ring	—	0·4–0·645		0·48		—		0·42–0·5		0·33–0·38	
Ant. end to cervical papillæ...	—	0·46–0·54		0·65		—		0·39–0·45			
Ant. end to excretory pore ..	—	0·67–1·17		—		—		0·85–0·9		0·54–0·6	
Tail, length	0·24	1·03–1·56 [1·76]	0·395–0·71 [1·27]	[0·6]	[0·77]	[0·318]	[0·12]	0·8	0·42–0·44	0·55	0·4
Spicules, lengths	0·46, 0·12	1·32–2·125, 0·36–0·41		0·44, 0·19		0·76, 0·29		1·5, 0·4		1·2, 0·26–0·27	
Eggs	—	0·047–0·052 × 0·02875–0·037		0·043 × 0·029		0·049 × 0·031		0·045 × 0·032		0·038 × 0·027	

10. *Proleptus* (?) *rajæ* (Diesing, 1851).

Syn. *Spiroptera rajæ* Diesing, 1851; *Spiroptera Rajæ batis* Diesing, 1851; *Spiropterina rajæ* Parona, 1894; *Spiroptera rajæ clavatæ* Molin, 1860; *Spiropterina rajæ clavatæ* v. Linstow 1890.

All the names quoted above seem to have been based on larval forms recorded by Bellingham and by Dujardin, and do not refer to any identifiable species.

11. "*Proleptus*" *tortus* v. Linstow, 1906.

This species, recorded from a tortoise, *Cistudo ornata*, does not appear from v. Linstow's description to be a *Proleptus*, but may be a *Physaloptera*.

12. "*Proleptus*" *gordioides* v. Beneden, 1858.

This worm was found in the walls of the uterus and in the chorion of the eggs of *Galeus canis*. From v. Beneden's description and figures (1871) it seems almost certain that it was not a *Proleptus*, and more probable that it was a species of *Philometra*.

From the preceding review it appears that six species may be recognized with some degree of probability as belonging to the genus *Proleptus*. Some of the more important measurements of these are given in the table on p. 333. The measurements are in millimetres. The figures in square brackets have been calculated from proportional measurements given by v. Linstow.

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XXXIV.—*New or little-known* Tipulidæ (*Diptera*).—L. *Australasian Species*. By Charles P. Alexander, Ph.D., F.E.S., Massachusetts State College, Amherst, Massachusetts, U.S.A

The crane-flies discussed herewith are all from Eastern Australia, where they were collected by my colleagues, Messrs. Heron, Illingworth, Tonnoir, and Wilson, to whom I am greatly indebted for this further aid in making known the vastly rich fauna of the Commonwealth. The material collected by Tonnoir is preserved in the Station Collection at Canberra; the Wilson specimens are preserved in the cabinet of the collector; the remaining specimens are retained in my own collection.

Limonia (*Dicranomyia*) *punctulatella*, sp. n.

Closely allied and generally similar to *L.* (*D.*) *punctulata* (de Meijere) of the Greater Sunda Islands, differing especially in the structure of the male hypopygium.

Male.—Length about 5 mm.; wing 5·8 mm.

Rostrum, palpi, and antennæ black throughout. Mesonotal præscutum reddish brown, with three darker brown stripes, of which only the median one is broad and distinct. Femora darkened subterminally. Wings with about five or six dark spots in cell *C* between arculus and stigma; a large oval dark spot on vein *M* just beyond one-third the length; remainder of wing-pattern as in the group. Male hypopygium with the caudal margin of tergite broadly emarginate, each lateral lobe with about eighteen to twenty coarse setæ. Ventromesal lobe of basistyle very stout and broad-based. Dorsal dististyle gently curved, a little dilated just before the short straight apical spine. Ventral dististyle with the rostral prolongation long and stout, with two spines placed on a broad tubercle, the more basal spine placed low on ventral margin of prolongation, the two spines separated by a distance subequal to the length of the outer spine. Gonapophyses with the mesal-apical lobe appearing as a slender, smooth, blackened spine, the acute tip gently curved.

Hab. North Queensland.

Holotype, ♂, Babinda, Cairns district, October 1920 (*J. F. Illingworth*).

A large number of perfectly valid species of *Dicranomyia* have been confused under the name *punctulata*, including, besides the typical species, *fullowayi* (Alexander), *neopunctulata* Alexander, *punctulatoides* Alexander, and *subpunctulata* Alexander. The included forms range from North India and Western China, eastward into Japan, and southward and eastward throughout all the major Malayan Islands, to North Queensland. Furthermore, *L.* (*D.*) *punctipennis* (Skuse) and allied species in New Zealand and in South and West Australia must likewise be held to pertain to this same group of crane-flies. The present fly is entirely distinct from all described members of the group in the presence of two widely separated spines on the rostral prolongation of the ventral dististyle of the male hypopygium.

Limonia (*Dicranomyia*) *kulin*, sp. n.

Closely allied and generally similar to *L.* (*D.*) *punctipennis* (Skuse), differing especially in the broader wings, with a conspicuous costal fringe in the male sex, and in the details of structure of the male hypopygium.

Male.—Length 5·5–6 mm. ; wing 6–7 mm.

Female.—Length about 7·5 mm. ; wing 8 mm.

General coloration grey, the mesonotum variegated with darker grey. Wings broader than in *punctipennis*, the cells correspondingly widened ; ground-colour more greyish yellow, the characteristic wing-pattern of the group clearly defined. Costal fringe (male) long and conspicuous. Male hypopygium with the tergite transverse, the caudal margin very shallowly and broadly emarginate. Ventral dististyle elongate, its area approximately twice the basistyle ; rostral prolongation decurved, relatively small, with two short rostral spines that are placed close together low down on cephalic margin of prolongation at about one-third the length; spines nearly equal in size, a little more than one-half the length of the prolongation alone. Gonapophyses with the mesal-apical lobe blackened apically, curved into a horn, the outer margin before apex with more or less distinct small pale spicules.

Hab. New South Wales, Victoria.

Holotype, ♂, Narooma, New South Wales, November 25, 1930 (*A. L. Tonnoir*).

Allotype, ♀, mountains above Millgrove, Victoria, December 22, 1929 (*F. E. Wilson*).

Paratype, ♂, with the allotype.

The specific name is that of a native tribe of South-east Australia.

Limonia (*Dicranomyia*) *canithorax*, sp. n.

General coloration of thorax light grey; antennæ black, the basal flagellar segments nearly globular; mesonotal præscutum with central portion clear grey, on either side with yellowish or golden pollen; knobs of halteres infuscated; legs passing from dark brown to black; wings with a brownish-yellow suffusion, the costal margin more saturated, concolorous with the stigma; cell 1*st* M_2 closed; male hypopygium with the ventral dististyle smaller than the basistyle; rostral spines two, arising close together.

Male.—Length about 8 mm.; wing 8·5 mm.

Rostrum black, grey-pruinose, somewhat produced, if taken with the porrect labial palpi nearly as long as remainder of head; maxillary palpi black. Antennæ black, the scape grey-pruinose, the pedicel somewhat paler; basal two or three flagellar segments nearly globular, with short necks, the outer segments passing into oval; verticils of outer segments becoming small and inconspicuous, shorter than the segments; terminal segment a little larger than the penultimate. Head grey; eyes relatively small; anterior vertex wide, nearly three times the diameter of the scape.

Pronotum grey. Mesonotal præscutum with a clear grey median line, on either side of which the sclerite is slightly yellowish brown to golden, the humeral region remaining grey; posterior sclerites of mesonotum clear light grey. Pleura clear grey, the dorso-pleural region a trifle more pollinose. Halteres short, obscure yellow, the apices of the knobs infuscated. Legs with the coxæ generally pale, sparsely pruinose, the fore coxæ somewhat darker ; trochanters obscure yellow ; femora basally brownish yellow, passing through brown to dark brown at tips ; tibiæ brown, the tips passing into black ; tarsi black ; claws with a single basal spine. Wings with a brownish-yellow suffusion, the costal region more saturated, somewhat as in *auripennis*, this colour not passing distad beyond the nearly concolorous stigma ; veins pale brown. Costal fringe relatively long and dense. Venation : Sc_1 ending opposite origin of *Rs*, Sc_2 faint, Sc_1 alone nearly equal to *m–cu* ; *Rs* slightly angulated at origin, about one-third longer than the basal section of R_{4+5} ; free tip of Sc_2 a little proximad of R_2 ; inner end of cell *1st* M_2 slightly arcuated ; *m–cu* shortly before fork of *M* ; cell *2nd A* wide.

Abdominal tergites dark brown, very sparsely pruinose, the sternites more obscure yellow, becoming darker on the outer segments. Male hypopygium with the caudal margin of tergite only gently emarginate. Basistyle with the ventro-mesal lobe large, pale, with long but relatively sparse setæ on mesal face. Ventral dististyle small, not as extensive as the basistyle, the mesal edge sloping steeply to the conspicuous rostral prolongation ; two rostral spines, subequal in length, placed close together, arising from small basal tubercles. Dorsal dististyle a flattened blade that narrows into a long acute black point. Gonapophyses with the mesal-apical lobe pale, its lateral margin with two or three microscopic teeth.

Hab. New South Wales.

Holotype, ♂, Mt. Victoria, Blue Mountains, October 20–30, 1930 (*F. E. Wilson*).

The coloration of the wings is much as in *L.* (*D.*) *auripennis* (Skuse), but the clear grey coloration of the head and thorax, in conjunction with the large size and structure of the male hypopygium, readily separate the fly from all similar Australian species.

Limonia (*Dicranomyia*) *validistyla*, sp. n.

General coloration grey ; antennæ black throughout ; mesonotal præscutum with three clearly defined brown stripes ; halteres pale yellow, the knobs dark brown ;

legs black, the femoral bases obscure yellow, narrowest on the fore legs; wings with a strong brown tinge, washed and seamed with still darker brown; Sc_1 relatively short; *m–cu* close to fork of *M*; male hypopygium with the caudal margin of tergite convexly rounded; dorsal dististyle a very powerful blackened rod that is bent beyond mid-length at about a right angle.

Male.—Length about 7·5 mm.; wing 8·5 mm.

Rostrum dark brown; palpi black. Antennæ black throughout; flagellar segments suboval, the verticils not exceeding the segments. Head dark grey, the centre of posterior vertex a little darker.

Pronotum and mesonotum grey, the præscutum with three clearly defined brown stripes, the median one ending before the suture; scutal lobes extensively infuscated. Pleura dark grey. Halteres pale yellow, the knobs dark brown. Legs with the coxæ dark grey; trochanters obscure yellow; femora yellow basally, passing into black, the pale bases narrowest on the fore legs, more extensive on the posterior legs; remainder of legs black. Wings with a strong brown tinge, the oval stigma dark brown, conspicuous; narrower and less evident brown seams at origin of *Rs*, along cord and outer end of cell 1*st* M_2; a dusky streak along vein *Cu* in cell *M*; veins brownish black. Venation: Sc_1 ending opposite origin of *Rs*, Sc_2 not far from its tip; free tip of Sc_2 and R_2 in transverse alignment; *Rs* weakly angulated at origin; basal section of R_{4+5} about two-thirds *Rs*; *m–cu* close to fork of *M*; anal veins at origin parallel or gently converging.

Abdomen black, sparsely pruinose; hypopygium brownish yellow. Male hypopygium with the caudal margin of tergite convexly rounded. Ventro-mesal lobe of basistyle of moderate size. Dorsal dististyle an unusually powerful chitinized rod, just beyond mid-length bent at a right angle, slightly widened at the angle, apex of style narrowed to an acute black spine. Ventral dististyle about as large as the basistyle, roughly triangular in outline; rostral prolongation stout, with two spines placed on the face of prolongation at near mid-length; spines separate, equal in size and shape, the outer placed a little less than its own length from apex of prolongation. Mesal-apical lobe of gonapophysis long and slender.

Hab. Victoria.

Holotype, ♂, Mt. Donna Buang, above Warburton, altitude 3000–4000 feet, December 6, 1931 (*F. E. Wilson*).

Limonia (*Dicranomyia*) *validistyla* is most like *L.* (*D.*) *obscura* (Skuse), but is very different from all regional species in the structure of the hypopygium. Through the kindness of Mr. Woodhill and the Trustees of the Macleay Collection, Sydney, I have been furnished with enlarged photomicrographs of the genitalia of the holotype of *obscura*. From these it has become apparent that the species described as *inculta* Alexander is identical with *obscura* and must be placed in the synonymy.

Limonia (*Dicranomyia*) *octacantha*, sp. n.

General coloration of notum yellowish brown, the præscutum with three brown stripes; antennæ black throughout; halteres pale; wings greyish subhyaline, clouded and streaked with greyish brown; Sc_1 ending opposite one-fifth the length of *Rs*, Sc_2 not far from its tip; *m–cu* some distance before fork of *M*; male hypopygium with the ventral dististyle produced into an elongate rostral prolongation that bears a pair of spines at apex and a second pair at base.

Male.—Length about 7 mm.; wings 8·7 mm.

Rostrum black, sparsely pruinose; palpi black. Antennæ black throughout; flagellar segments suboval, the outer segments much narrower at proximal end than at apex; verticils a little shorter than the segments; terminal segment subequal to or a little longer than the penultimate. Head brownish grey; anterior vertex narrow, about one-half the diameter of scape.

Mesonotal præscutum yellowish-brown pollinose, with three conspicuous brown stripes; posterior sclerites of mesonotum more pruinose, the scutal lobes darkened. Pleura grey, clearer light grey on the ventral sclerites, more darkened on the anepisternum and pteropleurite. Halteres elongate, chiefly dirty whitish, the base of knob weakly infumed. Legs with the coxæ dark, pruinose; trochanters obscure yellow; femora obscure brownish yellow basally, broadly blackened at tips; tibiæ and basitarsi dark brown, the tips very narrowly blackened; remainder of tarsi black; claws large, each with a conspicuous basal tooth. Wings greyish subhyaline, clouded and streaked with more greyish brown; stigma pale brown; pale clouds at origin and fork of *Rs*, fork of *M*, and on *m–cu*; outer end of cell 1st M_2; pale grey streaks along most longitudinal veins and along the centre of cell *R*; veins brown. Venation: Sc_1 ending about opposite one-fifth the length of *Rs*, Sc_2 close to its tip; free tip of Sc_2 lying a little proximad of R_2; inner end of cell R_3 about on a level with *m–cu* and lying far before the other cells of the cord; *m–cu* about three-fourths its length before fork of *M*.

Abdomen black, sparsely pruinose; hypopygium yellowish brown. Male hypopygium with the tergite large, transverse, narrowed outwardly, the caudal margin truncated to very insensibly emarginate medially, with about a score of setæ, all of which are marginal in position. Ventro-mesal lobe of basistyle large. Dorsal dististyle a nearly straight blackened rod, the acute tip a little curved. Ventral dististyle fleshy, subequal in area to basistyle, the rostral prolongation produced into a long slender structure that bears four spines, an outer pair placed on a common tubercle far out toward end of prolongation, and an inner pair from slightly unequal tubercles placed at the extreme base of prolongation, the two pairs of spines being separated by a distance equal to more than one-half the length of the dorsal dististyle; outer spines subequal, pale basally; inner spines a little shorter; apex of rostral prolongation truncated, with several setæ. Gonapophyses with the mesal-apical lobe long and narrow, blackened, the outer margin microscopically serrulate. Apex of ædeagus simple.

Hab. Victoria.

Holotype, ♂, Mt. Donna Buang, above Warburton, altitude 3000–4000 feet, April 1931 (*F. E. Wilson*).

Limonia (*Dicranomyia*) *octacantha* is a rather remarkable species, the type of male hypopygium being very distinctive. The nearest ally would seem to be *L.* (*D.*) *flagellifer* Alexander, of south-eastern Australia, which is readily told by the structure of the hypopygium, the rostral prolongation being long-bispinous.

Linonia (*Dicranoymia*) *cunninghamensis*, sp. n.

General coloration of mesonotum yellow, the præ-scutum slightly darker medially; scutellum and medio-tergite darker brown; legs chiefly yellow; wings yellow, the stigma brown; Sc_1 long; *Rs* relatively short, only a little longer than, or subequal to, the basal section of R_{4+5}; male hypopygium with the rostral spines long, straight, strongly divergent.

Male.—Length about 4·5 mm.; wing 6 mm.

Female.—Length about 5·5–6 mm.; wing 7·5–8 mm.

Rostrum obscure ochreous; basal segment of maxillary palpus yellow, the remainder black. Antennæ with the basal segment slightly brightened at base, the remainder dark brown; flagellar segments oval, with short verticils. Head brownish yellow, opaque, with a sparse grey pruinosity.

Mesonotum yellow, the præscutum with a slightly darker median line; median region of scutum, scutellum, and mediotergite darker brown. Pleura pale testaceous-yellow. Halteres relatively short, the stem yellow, the knobs infuscated. Legs with the coxæ and trochanters pale yellow; remainder of legs yellow, the outer tarsal segments infuscated. Wings pale yellow, the oval stigma brown; veins brown, those before the cord more yellowish. Venation: Sc_1 ending opposite origin of *Rs*, Sc_2 some distance from its tip, Sc_1 alone being a little shorter than *Rs*, the latter in turn being a little longer and more arcuated than the basal section of R_{4+5}; *m–cu* at fork of *M*, subequal to or longer than the distal section of Cu_1.

Abdominal tergites brown, the sternites more yellowish; hypopygium and subterminal segments yellow. Male hypopygium with the caudal margin of the ninth tergite broadly emarginate. Ventro-mesal lobe of basistyle large, with conspicuous setæ. Dorsal dististyle a curved chitinized rod, narrowed to the long acute tip. Ventral dististyle relatively small, less than the basistyle; rostral prolongation conspicuous, broad-based, narrowed to a very slender apical point; rostral spines long and slender, straight, each subequal to the prolongation itself, conspicuously divergent, arising from small basal tubercles. Gonapophyses with the mesal-apical lobe long and slender.

Hab. Victoria.

Holotype, ♂, Ben Cairn, near Millgrove, in beech-gully (*Nothofagus Cunninghamii*, H. f.), altitude 2900–3200 feet, February 9, 1929 (*F. E. Wilson*).

Allotopotype, ♀.

Paratopotype, ♀.

Limonia (*Dicranomyia*) *cunninghamensis* requires no comparison with any of the other chiefly yellow species of the subgenus.

Limonia (*Dicranomyia*) *kurnai*, sp. n.

General coloration shiny yellow ; mesonotum with two black lines on the scutum, scutellum, and mediotergite; pleura narrowly lined and spotted with black ; wings with a faint brown tinge, the margin narrowly infuscated ; cord, outer end of cell *1st* M_2, and vein *Cu* seamed with brown ; abdomen yellow and black, the sternites bright yellow with their lateral margins black.

Male.—Length about 5·2–5·5 mm. ; wing 6–6·3 mm.

Female.—Length about 6 mm. ; wing 6·5 mm.

Rostrum brownish yellow, about one-fourth the length of remainder of head ; palpi black. Antennæ black throughout ; basal flagellar segments subglobular to short-oval, the outer segments passing to elongate-oval ; verticils inconspicuous. Head light brown ; anterior vertex about one-half wider than diameter of scape.

Pronotum black medially, paling to yellow on sides. Mesonotum shiny obscure yellow, the præscutum with a conspicuous black median stripe that does not reach the sutre behind ; lateral stripes feebly indicated, sometimes subobsolete, pale brown, crossing the suture and passing into black on the scutal lobes, scutellum, and mediotergite, becoming confluent on caudal margin of latter sclerite, the two stripes enclosing yellow areas. Pleura shiny yellow, lined with black, including longitudinal streaks on suture between anepisternum and sternopleurite, and on ventral sternopleurite ; smaller spots on dorsal anepisternum, ventral pleurotergite, and meron. Halteres dusky. Legs with coxæ testaceous-yellow ; trochanters more greenish yellow ; femora brown, more yellowish basally, passing into black at tips ; tibiæ and tarsi brownish black ; claws with a long basal spine. Wings with a faint brownish tinge, the entire margin narrowly darker brown ; stigma oval, dark brown ; cord, outer end of cell *1st* M_2, vein *Cu*, and axilla similarly seamed with brown ; veins dark brown. Venation : Sc_1 ending about opposite origin of *Rs*, Sc_2 some distance from its tip, Sc_1 alone subequal to *m–cu* ; cell *1st* M_2 closed ; *m–cu* at or close to fork of *M* ; anal veins at base very gently converging.

Abdominal tergites with caudal margins yellow, the basal rings more obscure yellow, at near mid-length of each tergite with brownish black areas, these larger on the outer segments; sternites bright yellow, the lateral margins conspicuously black, on the outer segments the caudal margins similarly darkened; hypopygium chiefly testaceous-yellow. Male hypopygium with the tergite transverse, the caudal margin broadly emarginate, the lateral lobes provided with long coarse setæ. Basistyle with its ventro-mesal lobe large and stout. Dorsal dististyle a strongly curved blackened rod, the distal third narrowed. Ventral dististyle subequal in area to basistyle; rostral prolongation with two long straight spines that exceed the prolongation in length, these spines slightly retrorse. Gonapophyses pale, the mesal-apical lobe of moderate width, the tip obtuse. Ovipositor with the cerci blackened, small, slender, upcurved; hypovalvæ stout, deep horn-colour, more blackened basally.

Hab. Victoria.

Holotype, ♂, Ringwood, March 1931 (*F. E. Wilson*).

Allotopotype, ♀.

Paratopotypes, 2 ♂♂; *paratypes*, 2 ♂♂, Warburton, April 1931 (*F. E. Wilson*).

The specific name, *kurnai*, is that of an aboriginal Victorian tribe. The species is very different from any other described Australian member of the subgenus, being most nearly allied, perhaps, to species such as *dorsalis* Skuse and *viridiventris* Skuse.

Limonia (*Dicranomyia*) *whitei brevispinula*, subsp. n.

Male.—Length about 6 mm.; wing 7 mm.

Close to typical *whitei* Alexander (Victoria, Tasmania), differing especially in the structure of the male hypopygium.

Rostrum obscure ochreous; palpi black. Humeral region of præscutum strongly tinged with reddish brown. Male hypopygium with the spines of the rostral prolongation of the ventral dististyle very short, the distance between them about one-half their length. In typical *whitei* the spines are slender, the distance between them at their bases not more than one-fourth to one-fifth their length.

Hab. New South Wales.

Holotype, ♂, Brooklana, Eastern Dorrigo, altitude about 2000 feet, October–November 1929 (*W. Heron*).

Limonia (*Geranomyia*) *erasmi*, sp. n.

General coloration of mesonotum reddish brown, the præscutum with three more or less confluent black stripes; rostrum short, less than one-third the length of remainder of body; legs chiefly brownish black, the femoral bases yellow; wings subhyaline, unmarked except for the pale brown stigma; costal fringe (male) long.

Male.—Length, excluding rostrum, 6–6·5 mm.; wing 7–7·8 mm.; rostrum, about 1·6–1·7 mm.

Female.—Length, excluding rostrum, about 7 mm.; wing 7·5 mm.; rostrum about 1·4–1·5 mm.

Rostrum unusually short, black; palpi 3-segmented. Antennæ brownish black, the outer segments darker; flagellar segments short-oval, the outer segments a little more elongate. Head dark grey, anterior vertex subequal in width to diameter of scape.

Pronotum brownish black. Mesonotal præscutum reddish brown on humeral and lateral portions, the disk chiefly covered by three more or less confluent black stripes; scutal lobes chiefly blackened, their margins and the median area brighter; scutellum yellow, in cases darkened medially; mediotergite brownish yellow, more or less darkened caudally. Pleura blackened, pruinose, the pleurotergite and meron paler; in cases, the anepisternum likewise pale. Halteres pale, the apices of knobs dark brown. Legs with the coxæ testaceous-yellow, the fore coxæ darker; trochanters obscure yellow; femora chiefly brownish black, their bases restrictedly obscure yellow; tibiæ dark brown to brownish black; tarsi black. Wings subhyaline, the oval stigma a little darker; veins yellow to yellowish brown. Costal fringe (male) long and conspicuous. Venation: Sc_1 ending just before mid-length of Rs, Sc_2 at its tip; m–cu at or shortly before fork of M.

Abdomen dark brown, the hypopygium reddish yellow. Male hypopygium with the tergite transverse, the caudal margin convexly rounded, the median area restrictedly truncated or even feebly notched. Basistyle with the ventro-mesal lobe large. Dorsal dististyle a powerful rod, the distal half wider than the base, the tip gradually narrowed to a spine. Ventral dististyle fleshy, in area approximately twice the size of basistyle; rostral prolongation relatively short and stout; rostral spines two, about equal in length to the prolongation itself, placed on a low tubercle at near mid-length of the rostrum. Gonapophyses pale throughout.

Hab. New South Wales (Blue Mountains).

Holotype, ♂, Blackheath, October 1930 (*F. E. Wilson*).

Allotype, ♀, Wentworth Falls, October 1930 (*F. E. Wilson*).

Paratopotype, ♂; *paratype*, ♂, Mt. Victoria, October 1930 (*F. E. Wilson*).

I take great pleasure in naming this very distinct *Geranomyia* in honour of the collector, my friend, Mr. F. Erasmus Wilson. The fly is readily told from other members of the *Triphana* group by the immaculate wings and long costal fringe of the male sex.

Limonia (*Geranomyia*) *grus*, sp. n.

General coloration of mesonotal præscutum reddish, with three brownish-black stripes; rostrum slightly less than one-half the length of remainder of body; antennæ black throughout or with the pedicel brightened; flagellar segments subcylindrical, with an abrupt apical pedicel; wings greyish, with a more greyish-brown pattern, the chief areas at origin of *Rs* and stigma; Sc_1 ending beyond mid-length of *Rs*; male hypopygium with the rostral prolongation stout, with two rostral spines that are placed close together at about one-third its length.

Male.—Length, excluding rostrum, 5–5·5 mm.; wing 7–7·5 mm.; rostrum 2·3–2·5 mm.

Rostrum of moderate length, subequal in length to antenna, black throughout; palpi concolorous, 3-segmented. Antennæ black throughout, in the paratype with pedicel obscure yellow; flagellar segments subcylindrical to oval, with abrupt but short apical pedicels; verticils shorter than the segments; terminal segment about a third longer than the penultimate. Head dark grey; anterior vertex very narrow.

Pronotum dark brown. Mesonotal præscutum obscure reddish, with three brownish-black stripes, in the paratype more extensive and subconfluent; scutum chiefly brownish black ; posterior sclerites of mesonotum chiefly brownish black, sparsely pruinose. Pleura with the ground-colour reddish brown, in cases more variegated on the anepisternum, ventral sternopleurite and pleurotergite with darker brown. Halteres pale, the knobs infuscated. Legs with the coxæ and trochanters testaceous-yellow ; femora obscure yellow at bases, the outer half or more passing into dark brown ; remainder of legs dark brown. Wings with the ground-colour greyish, with an extensive, slightly darker, more greyish-brown pattern, the chief areas including the origin of *Rs* and the stigma ; cord and outer end of cell *1st* M_2 narrowly darkened ; fainter darkened clouds at wing-apex and in Anal field ; veins dark brown. Macrotrichia of veins relatively long and conspicuous ; costal fringe short. Venation : Sc_1 ending just beyond mid-length of *Rs*, Sc_2 at its tip ; *m–cu* at the for of *M*.

Abdominal tergites and hypopygium chiefly dark brown, pruinose ; basal sternites, in cases, a little more variegated with paler. Male hypopygium with the tergite transverse, the caudal margin gently emarginate, the lateral lobes with long coarse setæ. Basistyle with the ventro-mesal lobe with numerous conspicuous setæ. Dorsal dististyle a stout, gently curved rod, the apex suddenly narrowed into a spine. Ventral dististyle relatively small, not exceeding the basistyle in area ; rostral prolongation short, obtuse to subtruncated at apex ; rostral spines two, shorter than the prolongation, a trifle unequal, placed close together at about the basal third of the rostrum. Gonapophyses with the mesal-apical lobe stout, somewhat narrower in paratype, dark-coloured to blackened, the outer margin microscopically roughened. Ædeagus with the surface set with conspicuous small tubercles.

Hab. New South Wales, Victoria.

Holotype, ♂, mountains above Warburton, Victoria, April 1931 (*F. E. Wilson*).

Paratopotypes, 1 ♂, with type ; 1 ♂, altitude 3000–3800 feet, March 2, 1930 (*F. E. Wilson*) ; 2 ♂♂, altitude 600 feet, March 2, 1930 (*F. E. Wilson*) ; *paratype*, 1 ♂, Blundell's, Federal Capital Territory, New South Wales, February 18, 1931, bred from a pupa in gelatinous cocoon in running water (*A. L. Tonnoir*).

In its wing-pattern and venation, *Limonia* (*Geranomyia*) *grus* is most similar to *L.* (*G.*) *skuseana* Alexander (*fusca* Skuse, preoccupied), differing in the reduced palpi, details of body-coloration, and the structure of the male hypopygium, especially the position of the rostral spines and the nature of the ædeagus.

Limonia (*Libnotes*) *zelota*, sp. n.

General coloration ochreous, the præscutum with four narrow brown stripes; knobs of halteres infuscated; femora yellow, with a black subterminal ring, tibiæ and tarsi black; wings whitish, with a restricted brown and grey pattern; *m* short and transverse, only about one-half the basal section of M_3; vein *2nd A* near origin converging toward vein *1st A*.

Female.—Length about 13 mm.; wing 16·5 mm.

Rostrum buffy, the small palpi pale. Antennæ with the basal segment yellow; flagellar segments weakly bicolorous, the bases a little darker than the apices; flagellar segments oval, the outer segments becoming more elongate; terminal segment long and slender. Head, in unique type, chiefly concealed.

Mesonotum ochreous, the præscutum with four narrow brown stripes, the long intermediate pair approximated or confluent in front, not reaching the suture behind; lateral stripes short and narrow; all interspaces more or less suffused with dusky; lateral margins of præscutum slightly darkened; scutal lobes with brownish-grey centres; postnodal mediotergite with two brownish-grey lines, slightly convergent behind. Pleura chiefly ochreous. Halteres pale, the knobs infuscated. Legs with the coxæ and trochanters pale yellow, the latter slightly greenish; femora yellow, with a black subterminal ring that is about twice as wide as the greenish-yellow apex; tibiæ and tarsi black. Wings relatively broad, whitish, with a restricted brown and grey pattern; brown seams at origin of *Rs*, cord, outer end of cell *1st* M_2, Sc_2, and as an oval, oblique, stigmal area at free tip of Sc_2; paler brownish-grey seams along vein *2nd A*, vein R_{4+5}, and tips of veins M_3 and M_4; pale grey longitudinal streaks in cells *R* and R_1; veins yellow, dark brown in the infuscated areas. Venation: Sc_1 ending beyond *r–m*, Sc_2 at its tip; *Rs* long, more than three times the basal section of R_{4+5}; R_2 and free tip of Sc_2 in transverse alignment; *m* transverse, only about one-half the basal section of M_3; *m–cu* at near one-third the length of cell 1*st* M_2; vein 2*nd A* short, near origin converging strongly toward 1*st A*.

Abdomen ochreous, the tergites with conspicuous brown basal areas, the sternites more uniformly pale. Ovipositor with the valves relatively short and stout.

Hab. New South Wales.

Holotype, ♀, Brooklana, Eastern Dorrigo, altitude about 2000 feet, October–November 1929 (*W. Heron*).

In its large size and general appearance, the present fly suggests *D.* (*L.*) *restricta* (Alexander), differing notably in the coloration of the body and legs, and, especially, in the venation. By Edwards's key to the species of *Libnotes* (Journ. Feder. Malav St. Mus. xiv. pp. 74–80, 1928), *zelota* runs to beyond couplet 35, where it disagrees with all included forms.

Tonnoiromyia montina, sp. n.

Generally similar to *tasmaniensis*, differing especially in the shorter antennæ of the male, with longer and more conspicuous verticils, and in the structure of the male hypopygium.

Male.—Length about 5 mm.; wing 5·5 mm.; antenna about 2·8 mm.

Female.—Length about 6·5 mm.; wing 6·5 mm.; antenna about 1·9 mm.

Antennæ of male relatively short, if bent backward extending about to the end of the second abdominal segment, black throughout; flagellar segments weakly constricted at mid-length; verticils much longer and more conspicuous than in *tasmaniensis*, the longest ones unilaterally arranged and exceeding one-third the length of the segment; terminal (sixteenth) segment a tiny button. Head black, with a yellowish-grey pollen, the orbits more greyish.

Mesonotum black, sparsely pruinose (female) to more polished (male). Halteres black. Male hypopygium as in *tasmaniensis*, differing as follows:—Tergite broadly and evenly emarginate. Outer fleshy lobe of basistyle short. Outer dististyle with the lateral spine short and obtuse, the outer margin of the style with abundant erect setulæ. Inner dististyle with a conspicuous setiferous lobe on margin beyond base. The powerful structure interpreted as being a gonapophysis in *tasmaniensis* is here replaced by a slender sinuous spine, narrowed to an acute point, the margin quite smooth. Ædeagus elongate, bifid at apex.

Hab. New South Wales.

Holotype, ♂, Wentworth Falls, Blue Mts., October 20–30, 1930 (*F. E. Wilson*).

Allotype, ♀, Mt. Tomah, Blue Mts., October 20–30, 1930 (*F. E. Wilson*).

Tonnoiromyia montina is amply distinct from the more southern *T. tasmaniensis* Alexander (Victoria, Tasmania).

Helius (*Helius*) *mesorhyncha*, sp. n.

General coloration of mesonotum brownish yellow, the præscutum with three darker brown stripes, the posterior sclerites of notum and the pleura grey; knobs of halteres infuscated; rostrum relatively short, less than twice the remainder of head, obscure yellow; wings with a faint brown tinge, the stigma brown; *Rs* in alignment with R_{4+5}, the basal deflection of the latter lacking; *r–m* opposite fork of *Rs*.

Female.—Length, including rostrum, about 8 mm.; wing 6 mm.; rostrum about 0·8 mm.

Rostrum relatively short, a little less than twice the remainder of head, obscure yellow throughout; palpi black. Antennæ about as long as the rostrum, black throughout; flagellar segments oval, gradually decreasing in size outwardly; verticils only a little longer than the segments. Head grey; anterior vertex about one-half wider than the diameter of the scape.

Pronotum dark grey. Mesonotal præscutum with the ground-colour brownish yellow, with three darker brown stripes, the median one weakly divided behind; posterior sclerites of mesonotum grey, the centres of the scutal lobes darker, the posterior margin of scutellum somewhat brighter. Pleura grey. Halteres pale, the knobs infuscated. Legs with the coxæ brownish yellow; trochanters yellow; femora, tibiæ, and basitarsi obscure yellow, the tips narrowly darkened; outer tarsal segments more uniformly brown. Wings relatively narrow, with a faint brown tinge, the prearcular and costal regions clearer yellow; stigma oval, brown; wing-tip in outer radial field narrowly darkened; a scarcely evident darkening on anterior cord; veins brown, paler in the flavous portions. Venation: Sc_1 ending shortly before fork of *Rs*, Sc_2 near its tip: *Rs* in alignment with R_{4+5}, the basal deflection of the latter lacking; branches of sector diverging, cell R_3 at margin about one-third more extensive than cell R_2; *r-m* at fork of *Rs*; cell 1*st* M_2 widest across basal portion; *m–cu* close to fork of *M*.

Abdominal tergites dark brown, the sternites more yellowish brown; valves of ovipositor elongate.

Hab. New South Wales.

Holotype, ♀, Blundell's. Federal Capital Territory, January 21, 1931 (*A. L. Tonnoir*).

Helius (*Helius*) *mesorhyncha* differs from the other described Australian species of the subgenus in the shorter rostrum and in the details of body and wing coloration, and in venation. The nearest described species would seem to be *H.* (*H.*) *fulvithorax* (Skuse), which has the rostrum about as long as the entire thorax and with the thoracic dorsum fulvous, without stripes.

Limnophila buangensis, sp. n.

Belongs to the *pilosipennis* group, allied to *egena*; general coloration of thorax brownish yellow, the præscutum with three darker stripes; antennæ (male) of moderate length, exceeding one-half the length of body; wings with a brown tinge, the stigma a trifle darker; male hypopygium with the interbase a flattened horn-yellow plate, the mesal edge with a few teeth; gonapophyses oval, blackened, terminating in an acute point.

Male.—Length about 5–5·5 mm.; wing 6·5–7 mm.; antenna about 3–3·2 mm.

Rostrum brownish black; palpi black. Antennæ (male) black, elongate, considerably longer than in *egena*, but shorter than in *mitocera* and allies; flagellar segments cylindrical, with a conspicuous erect pubescence; terminal segment about one-third the length of penulsimate. Head blackened, grey-pruinose, more heavily to on anterior vertex and orbits; vertex not shiny.

Pronotum dark brown. Mesonotal præscutum almost covered by three confluent brown stripes, the humeral and lateral portions obscure yellow; posterior sclerites of mesonotum more brownish yellow. Pleura testaceous-yellow to brownish yellow. Halteres elongate, obscure yellow, the knobs infuscated. Legs with the coxæ and trochanters yellowish testaceous; remainder of legs black, the femoral bases very restrictedly yellow. Wings with a brownish tinge, the stigma a trifle darker; veins light brown. Macrotrichia in apices of radial and medial cells relatively sparse, usually confined to outer third or fourth of cell. Venation: Sc_1 elongate, nearly twice m–cu; R_{2+3+4} a trifle longer than basal section of R_5; cell M_1 lacking; m–cu at near mid-length of cell 1*st* M_2.

Abdominal tergites brownish black, darker at margins; sternites brownish yellow, darkened laterally, the subterminal segments uniformly blackened; hypopygium obscure yellow. Male hypopygium as in the group. Outer dististyle with a long, blackened, apical spine, the ventral subterminal tooth reduced. Inner dististyle strongly narrowed on distal third. Interbase a powerful, flattened, horn-yellow plate, its mesal edge with a few teeth. Ædeagus bifid at apex, as in group. Gonapophyses appearing as blackened oval structures, each terminating in an acute point.

Hab. Victoria.

Holotype, ♂, Mt. Donna Buang, above Warburton, altitude 3000–4000 feet, December 6, 1931 (*F. E. Wilson*).

Paratopotypes, 3 ♂♂.

Limnophila buangensis is quite distinct from the other members of the *egena* subgroup in the length of the antennæ in the male sex, in conjunction with the structure of the male hypopygium. Among the described Australian species, *L. borchi* Alexander, *L. hilli* Alexander, and *L. nocticolor* Alexander have the antennæ (male) short; *L. egena* Alexander has the organ of moderate length (approximately 2 mm. in male), while *L. mitocera* Alexander and two allied species described herewith have the male antenna of quite unusual length (over 4 mm.).

Limnophila mitoceroides, sp. n.

Belongs to the *pilosipennis* group; allied to *mitocera*; antennæ (male) exceeding the entire body in length; wings with a strong brownish tinge; macrotrichia in outer ends of cells R_3 to M_4, inclusive; Sc_1 longer than 1*st* M_2; *m–cu* at near mid-length of cell 1*st* M_2; male hypopygium with the outer dististyle having only a microscopic apical notch; gonapophyses with the apical spine short and stout, strongly curved.

Male.—Length about 4·5 mm.; wing 4·8 mm.; antenna about 5 mm.

Rostrum short, testaceous; palpi brownish black. Antennæ (male) elongate, exceeding the entire body; scape and pedicel obscure yellow; flagellum dark brown; flagellar segments very long-cylindrical, with conspicuous outspreading setæ that are approximately one-third the length of the segment itself. Head blackish, the surface very sparsely dusted with grey; frons paler; anterior vertex broad, with a median carina.

Mesonotum light brown, the lateral portions of præscutum more yellowish. Pleura chiefly yellow. Halteres pale, the knobs infuscated. Legs with the coxæ and trochanters yellowish testaceous; remainder of legs brownish black, the femoral bases restrictedly paler. Wings with a strong brownish tinge; stigma lacking; veins brown. Macrotrichia in outer ends of cells R_3 to M_4, inclusive. Venation: Sc_1 ending opposite fork of *Rs*, Sc_2 some distance from its tip, Sc_1 alone being longer than cell 1*st* M_2; R_{2+3+4} and basal section of R_5 short and subequal; R_2 very faint; *m–cu* at near mid-length of the narrow cell 1*st* M_2.

Abdomen dark brown, the hypopygium a trifle brighter. Male hypopygium with the outer dististyle having only a microscopic apical notch, the outer spine larger than the inner. Gonapophyses with the main body a dilated plate, the apical sgine short and stout, strongly curved.

Hab. New South Wales.

Holotype, ♂, Dorrigo, East Dorrigo, altitude about 2000 feet, April 20, 1931 (*W. Heron*).

The present fly is most nearly allied to *L. mitocera* Alexander (Victoria), differing in the even more elongate antennæ, the venation and coloration of the wings, and in the structure of the male hypopygium.

Limnophila tasioceroides, sp. n.

Belongs to the *pilosipennis* group; allied to *mitocera* and *mitoceroides*; antennæ (male) exceeding the entire body in length; wings with a strong brown tinge;

macrotrichia in outer ends of cells R_3 to M_4, inclusive; Sc_1 short, both Sc_1 and Sc_2 lying distad of level of fork of *Rs*; R_{2+3+4} elongate, approximately three times the basal section of R_5; male hypopygium with the gonapophyses appearing as pale foot-shaped blades.

Male.—Length about 4 mm.; wing 4·5 mm.; antenna about 5 mm.

Female.—Length about 6 mm.; wing 5·6 mm.; antenna about 1·8 mm.

Rostrum and palpi brownish black. Antennæ with the scape short, black; pedicel brown; flagellum (male) longer than entire body, the segments very long-cylindrical, with outspreading verticils that are a little longer than one-third the length of the segments. Head dark brown, opaque; anterior vertex broad, without a distinct median carina.

Mesonotum and pleura almost uniformly dark brown. Halteres elongate, dusky, the base of stem paler. Legs with the coxæ and trochanters brownish testaceous; remainder of legs dark brown. Wings with a strong brown tinge, the stigmal region slightly darker brown; veins darker brown. Macrotrichia in outer ends of cells R_3 to M_4, inclusive. Venation: Sc_1 ending about opposite one-third the length of R_{2+3+4}, Sc_2 about its own length from tip, placed just beyond the fork of *Rs*; *Rs* angulated to weakly spurred at origin; R_{2+3+4} long and straight, exceeding R_{2+3} alone and nearly three times the basal section of R_5; R_2 faint, a little more than one-half R_{1+2}; cord transverse; *m–cu* about two-thirds its length beyond the fork of *M*.

Abdomen uniformly dark brown. Male hypopygium with the outer dististyle relatively short and stout, with coarse setæ; apical notch distinct, the outer spine slender and acute, the inner broadly triangular. Gonapophyses appearing as pale foot-shaped blades, the apical portion bent at about a right angle and gradually narrowed to a subacute, gently decurved point. Ædeagus relatively long, feebly sinuous to weakly spiraliform at near mid-length, the apex pale.

The female that I am describing as allotype agrees in most respects, differing from the male as follows:—Antennæ short. Mesonotum, excepting postnotum, more reddish brown. Wings more strongly tinged with brown.

In both wings of this specimen, a minute cell M_1 is present, indicating the possibility of this being a normal condition for the species.

Hab. New South Wales.

Holotype, ♂, Dorrigo, East Dorrigo, altitude about 2000 feet, June 20, 1931 (*W. Heron*).

Allotopotype, ♀, June 1, 1931.

Limophila tasioceroides is most nearly allied to *L. mitoceroides*, sp. n., differing chiefly in the venation and structure of the male hypopygium. The two species are quite distinct from the other described members of the group in the very elongate antennæ of the male sex. This latter feature, together with the type of venation, gives to the present species a superficial resemblance to the Eriopterine genus *Tasiocera* Skuse, whence the specific name.

Limnophila vera, sp. n.

Allied to *aureola*; general coloration yellow, the mesonotum with a continuous dark brown capillary vitta; halteres infuscated; legs with the tibiæ, tarsi, and tips of femora blackened; wings narrow, the ground-colour very pale yellow, with a restricted brown pattern, including a common area at origin of *Rs* and fork of *Sc*; *Sc* very short, Sc_1 ending about opposite one-sixth the length of *Rs*; R_2 and R_{3+4} subequal.

Male.—Length about 5 mm.; wing 4·5 × 1·1 mm.

Rostrum light brown; palpi black. Antennæ short, if bent backward extending about to anterior portion of pronotum; scape and pedicel obscure yellow, flagellum black; verticils of outer segments a little exceeding the segments in length. Head strongly narrowed behind, brownish yellow, the posterior vertex with a linear brown area.

Pronotum infuscated medially, yellow laterally. Mesonotum obscure yellow, the præscutum more infumed in front, with a capillary brown median line that begins on the cephalic portion of the præscutum, continuing caudad to the abdomen, becoming wider on the scutellum and mediotergite. Pleura and pleurotergite testaceous-yellow. Halteres infuscated. Legs with the coxæ and trochanters pale yellow; femora yellow, the tips narrowly blackened; tibiæ and tarsi black; tibial spurs hairy on basal two-thirds. Wings narrow, the ground-colour very pale yellowish, sparsely variegated with small brown spots, including a common area at origin of *Rs* and fork of *Sc*; stigma small, quadrate; narrow seams along cord and outer end of cell *1st* M_2; a small marginal spot at end of vein R_3; vein brown, more luteous in the prearcular and costal regions. Venation: *Sc* very short, Sc_1 ending about opposite one-sixth the length of *Rs*, Sc_2 at its tip; R_2 subequal to R_{1+2} and R_{3+4}; cell 1*st* M_2 relatively narrow; *m–cu* at about one-third the length of cell 1*st* M_2; anterior arculus lacking.

Abdomen obscure yellow, narrowly blackened laterally, the caudal margins of the tergites pale brown; hypopygium chiefly pale. Male hypopygium much as in *aureola*; interbase of different shape, broadest on basal two-thirds, the distal third narrowed into a curved black spine.

Hab. Victoria.

Holotype, ♂, Dromana, November 3, 1931 (*F. E. Wilson*).

This distinct species is respectfully dedicated to Mrs. F. Erasmus Wilson. The only near relative is *L. aureola* Skuse, which differs conspicuously in the broad bright yellow wings, with small marginal darkenings at ends of all longitudinal veins, and in the different venation, as the loss of element R_{3+4}, R_2 being at or beyond the fork of vein R_{2+3+4} instead of far before it. The conspicuous median vitta on the mesonotum of the present fly together with the darkened halteres and legs furnish additional characters for the separation of the two flies. It would appear that these species may be found to belong to the Pseudolimnophilaria rather than to the Limnophilaria, where now placed.

Limnophila dorrigana, sp. n.

Male.—Length about 4 mm.; wing 5 mm.

Belongs to the *jucunda* group, closest to *brunneistigma* Alexander (Victoria).

Antennal flagellum dark brown, not light yellow, as in *brunneistigma*. Anterior sclerites of mesonotum opaque yellow, the median region of præscutum darkened as far caudad as the level of the pseudosutural foveæ; scutellum and postnotum darker brown. Legs testaceous-yellow, the terminal tarsal segments darkened. Wings greyish yellow, the basal and costal portions clearer light yellow; stigma oval, darker brown; very vague and scarcely indicated dark seams along cord and outer end of cell *1st* M_2, indicated chiefly by the darker veins. In *brunneistigma*, the membrane and veins, except the stigma, are light yellow. Wings widest opposite termination of vein *2nd A*. Venation: as in the *jucunda* group; Sc_1 ending about opposite two-thirds the length of Rs, Sc_2 not far from its tip; R_{2+3+4} relatively long, exceeding three times R_{2+3} alone the latter a little longer than either R_{1+2} or R_2, but all elements in the stigmal area are faintly indicated and difficult to delimit; *m–cu* about one-half its length beyond fork of M. Abdominal segments dimidiate, their caudal margins yellow, the bases brown. Male hypopygium with each gonapophysis terminating in a relatively short, very slender spine that lies close to body of apophysis. Ædeagus very short.

Hab. New South Wales.

Holotype, ♂, Dorrigo. East Dorrigo, altitude about 2000 feet, September 20, 1931 (*W. Heron*).

XXXV.—*Descriptions and Records of Bees.*—CXLVI.

By T. D. A. COCKERELL, University of Colorado.

Serapista pernigra (Cockerell).

Kenya: Nairobi, March 1926 (Imp. Inst. Entom.), ♀.

Belgian Congo: Logo, Ituri, Nov. 15, 1926, ♀ (*R. P. Thalman*), Congo Museum: Haut-Luapula, Kansenia, Oct. 20, 1929, ♀ (*Dom. de Montpellier*), Congo Museum.

Serapista æthiops Cockerell.

Belgian Congo: Elisabethville, Aug. 21, ♀ (*Dr. M. Bequaert*); Munama, Katanga, July 26, 1926, ♂ (*Ch. Seydel*), Congo Museum.

Scrapter basutorum (Cockerell).

Orange Free State: Ficksburg, Feb. 26–March 1 (*J. O.*). Described as ? *Capicola*.

Scrapter ornatipes Cockerell.

Natal: National Park, March 3–15 (*A. M.*, *J. O.*); both sexes.

Megachile consanguinea Smith.

Natal: National Park, March 3–15 (*A. M.*, *J. O.*); both sexes.

Halictus albofasciatus Smith.

Natal: National Park, March 3–15 (*J. O.*, *A. M.*). Orange Free State: Ficksburg (*J. O.*).

Halictus tenuimarginatus Friese.

Natal: National Park, 12 ♀♀, 2 ♂♂ (*J. O.*, *L. O.*, *A. M.*).

Friese described this from near Umvoti (presumably the Umvoti River), Natal, and Rondebosch, C.P. I herewith designate the Natal locality as that of the type, partly because it is first mentioned, but also because Friese refers to the fulvous hair.

Halictus pearsoni, sp. n.

♀.—Agrees with *H. tenuimarginatus* in nearly all respects except that the hair of head and thorax is much more scanty, very thin on thorax above, instead of dense and abundant, and whitish instead of strongly fulvous; the first three tergites are more or less distinctly glaucous; the tegulæ are much darker, and the nervures are darker. When the abdomen is seen in lateral view, the thick outstanding black hair, so conspicuous on the middle of third and fourth tergites of *H. tenuimarginatus*, is almost entirely absent. The hair on under side of abdomen, instead of being white, is fulvescent.

Cape Province: Kirstenbosch Botanic Garden (type-locality), Nov. 10 (*L. O.*); Doorn River, Nov. 3 (*L. O.*).

Friese's Rondebosch *H. tenuimarginatus* was evidently this species. Blüthgen, who examined the specimen, remarked on the characteristic blue-grey appearance of the first three tergites. The type-locality makes it appropriate to dedicate the insect to the memory of H. H. W. Pearson.

Halictus perpansus, sp. n.

♀.—Length about 9 mm.

Black, with four broad tegumentary bands on abdomen, the first narrower than the others, the first three dilute orange, the fourth creamy-white (varying to all the bands creamy white); first tergite dusky red, with a broad transverse black band on disc, not nearly reaching sides; second tergite obscure red at base and sides; third, when extended, showing reddish suffusion at base. Antennæ and legs entirely black, tegulæ black or slightly reddish. Very close to *H. abessinicus* Friese, from the highlands of Abyssinia, but wings hyaline, hardly at all dusky, stigma and nervures pale fulvo-testaceous, and first tergite with a black mark.

Natal: National Park, March 3–15 (*A. M.*, *J. O.*); 3 ♀.

This may be a subspecies of *H. abessinicus*, but Blüthgen reports what I take to be the same thing from the Transvaal, labelled by Friese as a variety of *H. abessinicus*, and, on comparing it with the type of the latter, gives good reasons for considering it another species. The same insect occurs in S. Rhodesia; there are two specimens in the Rhodesian Museum, identified as *H. abessinicus*, no doubt by Friese. A very similar and apparently conspecific insect (the first tergite, however, clear orange-fulvous) stands in the Britsh Museum as *H. tricolor* (Cameron, as *Paranomia tricolor*), but the name is preoccupied by Lepeletier.

Halictus partitus, sp. n.

♀.—Superficially exactly like *H. perpansus*, but certainly distinct, differing thus: head broader; tegulæ redder; flagellum obscurely reddish beneath, and also above at apex; the very large second cubital cell receiving recurrent nervure at apical corner (in *perpansus* well before apex); the third cubital cell a little broader above than second, its outer side presenting an obtuse angle, its apex not produced (in *H. perpansus* this cell is strongly produced at end, extending far beyond the second recurrent nervure, and the very oblique outer side is not angulate); only three tegumentary abdominal bands, the first two quite broad, and orange, the third narrower, and yellowish white; the fourth tergite has the margin very narrowly obscurely whitish; first tergite and extreme base of second ferruginous, the first with a very broad black band (very much larger than that of *H. perpansus*), which nearly reaches the sides. The pollen collected is light sulphur-yellow; that of *H. perpansus* orange.

Cape Province : Graaff-Reinet, Oct. 26 (*J. Ogilvie*).

All[illegible] Rhodesian [illegible] respects ; the [illegible] labrum ; the mandibles black, obscurely reddish subapically ; the abdomen with [illegible] red only on first two sternites ; legs black ; wings clear, only very faintly dusky. The mesothorax is quite dull, as in *H. perpansus.* Friese recorded *H. andreniformis* from Bulawayo, but also from "Kapland," and Blüthgen has designated the latter specimen (in the Berlin Museum) as the type. Blüthgen refers also to a variety *minor* Friese MS., from Willowmore, and gives enough details to validate the name. It does not appear to be *H. partitus*, although Blüthgen thinks it a species distinct from *H. andreniformis.* In any case, the name *minor* cannot be used, as Morawitz long ago used it for a different *Halictus.*

Halictus rufomarginatus Smith.

Cape Province : Doorn River, Nov. 2 (*J. O.*).

The tegulæ are black (red in type), but otherwise there is no difference.

Halictus ruwensorensis pulchrihirtus, subsp. n.

♀.—Length about 9·5 mm., anterior wing 7·4.

Black, including mandibles, legs (middle and hind tarsi rufescent apically), and tegulæ ; scape very long ; flagellum short, black, with about the apical half ferruginous beneath ; head ordinary ; clypeus short and transverse, convex, the apical part with strong punctures ; supraclypeal area convex, dullish , hair of head red, but thin and inconspicuous, black behind ocelli ; mesothorax entirely dull, with thin black and red hair ; scutellum and postscutellum densely covered with bright orange-ferruginous hair ; mesopleura with very dark brown hair, but tubercles fringed with red ; area of metathorax with fine parallel striæ, and a broad obtuse edge, the posterior margin transverse, not angulate. Wings greyish hyaline, the outer margins a little darker ; stigma and nervures (except the black costa) pale fulvous ; basal nervure falling short of nervulus ; second cubital cell broad, receiving first recurrent nervure a moderate distance from end; second recurrent a little more distant from end of third cubital cell. Legs with black hairs, except the red on inner side of tarsi; spurs dark red. Abdomen highly polished, with little hair, but first four tergites with narrow orange tegumentary bands, that on first very narrow; third and fourth tergites with a little black hair; fifth with pale reddish hair, the caudal furrow large and deep, margined above with orange; venter with much black hair, and long black hair at sides of third and fourth tergites. The hind spur has about seven widely spaced short rounded teeth.

Belgian Congo: Tshibinda (near Lake Kivu), Aug. 27 (*Alice Mackie*).

This appears to be a race of *H. ruwensorensis* Strand, from Mt. Ruwenzori, differing by the brilliant colour of the hair on scutellum and postscutellum, the entirely black basitarsi, and the paler wings. According to Chapin, it is just possible to see Mt. Ruwenzori from the top of the Kivu Volcanoes on a clear day; while looking in the opposite direction, it is possible to see the Tshibinda highlands.

Halictus patriciformis, sp. n.

♀ (type).—Length about 11·5 mm., anterior wing about 9.

Black, including mandibles, antennæ (flagellum a little reddened beneath, more evidently at apex), tegulæ, and legs; abdomen shining, with a glaucous appearance, first tergite with a very narrow yellowish-white margin, and second with traces of the same; hair of cheeks and at sides of clypeus dull white, but long fringe below clypeus, and long hair at sides of face and on top of head black; thorax with long pale dull fulvescent hair, the dorsum mainly bare; head rather broad; malar space linear; clypeus produced, shining, finely punctured, with a semilunar shining lower face on which are a few strong punctures; mesothorax shining, but not polished, the microscope showing a minutely tessellated surface with excessively minute punctures and scattered larger ones; scutellum shining, convex; area of metathorax large, in middle about as long as scutellum, dull, without evident sculpture, a little shining along the margin. Wings hyaline, the outer margin faintly greyish; stigma dark reddish brown, nervures brown; basal nervure falling a little short of nervulus; second cubital cell very broad, receiving first recurrent nervure a considerable distance from end, but not so far as second recurrent from end of third cubital, the latter cell being conspicuously produced. Legs with partly pale and partly black hair, black on outer side of hind tibiæ and basitarsi, on inner side of hind basitarsi appearing dusky in some lights and white in others; hind spur with many small nodule-like teeth, closely set together; disc of first tergite highly polished. Abdomen with scattered pale hair, not forming bands; venter with rather short reddish hair.

♂.—Long and narrow, anterior wing 7·4 mm.

Apical margin of clypeus broadly creamy white; antennæ black, flagellum very long, appearing nodulose beneath; mesothorax quite dull; scutellar region with abundant pale reddish hair; hind legs long and slender. Abdomen long and narrow; apex of second sternite elevated and shining; third sternite dull, with a microscopically striate surface, and a median groove, the apical margin presenting a transverse reddish shining elevation; fourth sternite with a broad erect brush of red hairs, which are bent at apex, not far from base, the part of the sternite beyond the brush somewhat concave and shining.

Belgian Congo: Tshibinda, female Aug. 27 (*J. Ogilvie*), male Aug. 26 (*Alice Mackie*).

Evidently allied to *H. subpatricius* Strand, from Ruwenzori, but that has clear fulvous tegulæ, and must be at least racially distinct. The male of *H. subpatricius* is unknown.

Halictus pulchricinctus, sp. n.

♀.—Length about 10 mm., anterior wing 8·3.

Robust, black, including antennæ and legs (except small joints of tarsi, which are red); mandibles with a red band in middle (sometimes hardly evident); tegulæ small, dark rufous; wings strongly reddened, the apical margin not darker, stigma and nervures dusky rufous, hair of head and thorax long, greyish white on cheeks and sides of thorax, pale reddish on region of antennæ, but dark at sides of face and on vertex, very pale reddish on thorax above, mixed with dark hairs on disc, but these not actually black; head ordinary; clypeus shining and well punctured, with a median channel; mesothorax and scutellum entirely dull; metathorax, including the truncation, covered with long erect pale hair. Basal nervure falling a little short of nervulus; second cubital cell broad, receiving first recurrent nervure not far from end; third cubital produced far beyond second recurrent. Legs with mainly dark hair, entirely black on outer side of hind tibiæ; spurs red, but the dental margin of hind spur black, with five or six short noduliform teeth. Abdomen dullish, but first tergite, and second more or less, shining; first two tergites with rather broad (broadest on second) orange tegumentary bands; no hair-bands, but when second tergite is much extended, its base is seen to be reddish, with fine thin pale pubescence: sides of fourth tergite with conspicuous long black hairs; venter with pale hair. The area of metathorax has very feeble plicæ, not easily seen without a microscope.

Cape Province: George (type-locality), Nov. 7 (*J. Ogilvie*). Kirstenbosch Botanical Garden, Nov. 10 (*L. Ogilvie*).

Nearest to *H. rufomarginatus* Smith, but with two orange bands on abdomen, and without the broad basal bands of pubescence. The strongly reddened wings are also distinctive.

Halictus perihirtus, sp. n.

♀.—Length 12 mm., anterior wing 9·4 mm.

Robust, looking like a rather large *Andrena*; black, including mandibles; flagellum obscurely reddened beneath; tegulæ red with a hyaline margin; wings yellowish hyaline, the apical field faintly greyish, not at all darkened: stigma and nervures ferruginous; legs black, with the middle and hind basitarsi, and joints 2 to 4 of all the tarsi, red, but the apical joint black, contrasting; hair of face, cheeks, and sides of thorax very pale fulvescent, but of vertex and thoracic dorsum ferruginous, very bright on vertex and scutellum, short on mesothorax, not mixed with black; head broad, with broad cheeks; clypeus large, dull and finely rugoso-punctate, with a smooth shining space on each side above margin, the lower corners with large thick downwardly directed teeth ; long red hairs from beneath clypeal margin ; mesothorax and scutellum shining, but finely and closely punctured, scutellum with a median groove ; area of metathorax very short, rugose, not plicate, with a shining margin ; legs with pale red hair ; hind spur long, curved at end, with numerous small short teeth ; basal nervure falling just short of nervulus ; second cubital cell very broad ; first recurrent nervure meeting the intercubitus ; outer nervures rather pale and weak ; third cubital cell short, second recurrent nervure joining it near the beginning of its last third ; abdomen broad, dull, greater part of first tergite shining ; first tergite with a spot of ochreous pubescence on each side toward base ; second with a very large basal patch on each side, and a rather narrow apical band, failing in middle ; third with broad basal and apical bands of ochreous tomentum, the basal one narrowed in middle ; fourth with a broad apical band, and rather indistinct basal one ; fifth with thin pale hair, caudal furrow very broad ; venter with pale reddish hair.

Orange Free State : Ficksburg, Feb. 26–March 1 (*J. Ogilvie*).

Superficially this closely resembles *Andrena notophila* Ckll., found in the same locality. In several characters, it resembles the much smaller *Halictus deceptus* Smith (of which *H. diversiformis* Ckll. is a synonym, as Blüthgen stated), but it is a very unique and distinct species. By the red hair on scutellum and some other characters, it recalls *H. rhodaspis* Ckll. In the Palæarctic fauna it falls near such species as *H. scabiosæ* Rossi, and no doubt it is derived from that general group.

Halictus probitus, sp. n.

♀.—Length about 7 mm., anterior wing about 5·2.

Head (including mandibles), thorax, and legs black ; flagellum obscure reddish beneath ; tegulæ rufotestaceous ; wings greyish hyaline, stigma and nervures pale dusky reddish ; abdomen with very broad apical part of first tergite, and second and third tergites except black marks at extreme sides, all bright chestnut-red ; fourth tergite black, with a broad hyaline hind margin, and a narrow red band before it; fifth black, the margins of the furrow appearing reddish from fine red hair; head broad, but ordinary; clypeus shining, well punctured, with a median pit; sides of face shining, but front dull; ocelli rather large and prominent; mesothorax shining, feebly punctured; scutellum with a median depression; area of metathorax dull, appearing granular under a lens; hair of head and thorax scanty, dull white. Basal nervure falling just short of nervulus; second cubital cell broad, receiving first recurrent nervure near end. Legs with pale hair. Abdomen moderately shining, first tergite highly polished; no hair-bands; basal part of venter red, the third sternite with a very broad black band.

Microscopic characters: clypeus bare, shining, with very large punctures, and a median ridge in the form of a reversed V, lower margin with a long dense straw-coloured fringe; front, and sides of face, with very thin long erect finely plumose hairs, not in the least concealing the surface; surface of front with minute contiguous punctures; disc of mesothorax shining but minutely tessellate, with small widely separated punctures; scutellum closely punctured, with minute punctures between the larger ones; postscutellum quite large, very finely punctured, the surface exposed; area of metathorax finely reticulate, about as long as scutellum; hind spur pectinate with about four oblique spines.

Cape Province: Oudtshoorn, Nov. 2 (*J. Ogilvie*).

This belongs with a group of forms which Blüthgen (1930) considered to represent a single species. One of these, *H. rufiventris* Friese, is described as having the abdomen all red, with whitish bands on tergites 3 and 4. I have not seen it *. The other three, described by Cameron, I saw in the British Museum, and my notes are as follows:—

"*H. pearstonensis* Cam.—Male with long black flagellum; stigma very dark brown; mesothorax shining, tegulæ red. (Cameron's type.)

"*H. schönlandi* Cam.—Female; face covered with dull white tomentum; stigma lighter and redder; mesothorax shining, tegulæ red. (Cameron's type.)

"*H. volutatorius* Cam.—Mossel Bay (*Turner*). Abdomen shining red, apical half more dusky; mesothorax very finely punctured, shining on disc; tegulæ red. Wings slightly brownish, stigma red; fore wing 5·3 mm.; area of metathorax dull. The male has the clypeus all black. Cameron says, 'front thickly covered with fuscous pubescence.' He says of *H. schönlandi*, 'the hair on the face, clypeus, and front is very dense, hiding the sculpture.'"

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* *H. rufiventris* was described in 1909, and again, as new, in 1925.

Thus *H. probitus*, with the hair of face and front very scanty, is certainly distinct, though closely allied.

Halictus atelopterus Cockerell.

Natal: Greytown, Oct. 20 (*L. O.*).

Smaller than the type, and with dark flagellum.

Halictus perlucens, sp. n.

♀.—Length about or a little over 7 mm.

Black, including mandibles and legs; flagellum very short, dusky rufous beneath; tegulæ testaceous; wings hyaline, very faintly dusky, stigma dusky red, nervures pale brownish; first four tergites with ivory-coloured tegumentary bands (the fourth discoloured in one specimen), the first band narrow, the others broad; hair of head and thorax scanty, pale, not fulvous dorsally; clypeal fringe long, shining whitish; clypeus convex, shining, sparsely punctured, not depressed in middle; front dull, but sides of face glistening; disc of mesothorax somewhat flattened, polished and shining, very feebly punctured; scutellum shining, with a median sulcus; area of metathorax large, shining at sides. Legs with white hair. Abdomen shining, the punctures very feeble; caudal furrow fringed with yellowish hair. Microscopic characters: area of metathorax with very fine weak rugulose sculpture, tending to run in lines, but not definitely reticulate or plicate; disc of first tergite with widely scattered extremely minute punctures; hind spur with many very fine oblique teeth. Second cubital cell rather small, receiving first recurrent nervure half as far from its end as second recurrent from end of third cubital.

Natal: National Park, March 3–15 (*A. Mackie, L. Ogilvie*).

Halictus pallidicinctus, sp. n.

♀.—Similar to *H. perlucens*, but a little larger; at first sight seeming identical, but quite distinct by the following characters: mesothorax and scutellum entirely dull; sides of face dull; flagellum longer, black, faintly reddish beneath at apex; tegulæ brown; hair of thorax more abundant, pale fulvous on scutellum, wings more dusky; abdominal bands suffused with pale orange; caudal furrow with its margins entirely black. The area of metathorax is smaller, and entirely dull, with very fine radiating sculpture. The hind spur does not differ.

Natal: National Park, March 3–15, 2 ♀ (*J. Ogilvie*).

H. pallidicinctus and *H. perlucens* appear to be derived from the same stock as *H. nomioides* Friese (Mt. Kilimandjaro), which has a dull mesothorax, and is closest to *H. pallidicinctus*. Also related is *H. albolineolus* (Cameron), cited by Meade-Waldo as a female, but the type is actually a male. It differs from our insects by the narrow, almost linear, abdominal bands; the head and thorax have much long pale grey hair; flagellum dark, faintly brown beneath; area of metathorax dull. This is extremely like *H. flavovittatus* W. F. Kirby, from Socotra.

Halictus perfumidus, sp. n.

♀.—Length 7 mm., anterior wing 5·5 mm.

Black, including mandibles, antennæ (flagellum very obscurely reddish beneath), tegulæ (with a very obscure reddish spot), and legs; wings dilute fuliginous; stigma large, very dark reddish, almost black; nervures dark brown, the outer recurrent and intercubitus weakened; abdomen very broad, shining black, without bands, but second tergite with a dull basal band, with a very minutely punctured surface, narrow in middle, greatly enlarged at sides, third with a narrower basal band of the same sort; sides of abdomen with some glittering white hair; apex with dense white hair at each side; head broad; clypeus shining, but strongly punctured; sides of face shining along orbits; mesothorax dull, shining in middle; scutellum dull, with a median groove; area of metathorax dull, without evident sculpture under a lens; hair of head and thorax white, extremely scanty; second cubital cell broad, receiving first recurrent nervure at extreme apical corner; second recurrent reaching third cubital cell not greatly beyond middle; spur with short nodule-like teeth.

Cape Province: near Cango Caves, Nov. 1 (*J. Ogilvie*).

In my manuscript key this runs next to *H. meruensis* Friese, as follows:—

Abdomen broader; scutellum dull, bigibbous; head much broader..............................	*perfumidus* Ckll.
Abdomen narrower; scutellum more shining, not evidently bigibbous; head oval; mesothorax shining. (Meru, 3000–3500 m.).............	*meruensis* Friese.

XXXVI.—*New Species of Heterocera in the National Museum, Washington.* By W. Schaus.

[Continued from vol. xi. p. 587.]

Noctuidæ.

Eriopyga nanduna, sp. n.

Male.—Third joint of palpi and frons vinaceous-fawn; palpi otherwise, collar and thorax light drab. Abdomen above light cinnamon-drab, underneath ecru-drab; anal hairs vinaceous-fawn. Fore wing light cinnamon-drab, the lines drab; basal fuscous points on costa and median followed by a fuscous point in cell; antemedial line fine, double, deeply and narrowly incurved below median, then sinuous to inner margin; orbicular large, round, partly paler, edged with a black point at inner edge; a hair-brown shade to reniform and a similar vertical shade from below reniform to inner margin; reniform large, only slightly constricted, edged by a pale pinkish-buff line partly punctiform; postmedial line outcurved from costa, minutely lunular, preceded from reniform by a buffy-brown shade, and followed by a similar shade to termen, darkest at costa; a subterminal straight line, slightly edged with hair-brown; a fine dark terminal line; cilia vinaceous-fawn. Hind wing white, semihyaline; veins finely wood-brown; termen narrowly benzo-brown; inner margin wood-brown. Fore wing below whitish, the cell hair-brown; a straight postmedial hair-brown line. Hind wing below: costa irrorated with drab; a postmedial series of short dark streaks on veins; no dark terminal shading.

Expanse 53 mm.

Habitat.—Itatiaya, Rio, Brazil.

Type.—Cat. No. 34368, U.S. N. M.

Allied to *E. gigantea* Schs.

Eriopyga tama, sp. n.

Male.—Palpi, head, collar, and thorax sorghum-brown; fore femora mikado-brown. Abdomen above light cinnamon-drab, laterally cinnamon, ventrally white; anal tufts vinaceous, cinnamon, the tufts underneath pale pinkish-cinnamon. Fore wing above: base vinaceous-drab limited by a vertical faint paler line outwardly with deep brownish-drab edging; antemedial space fawn-colour limited by a fine fuscous line, outcurved on costa, then straight and outbent from subcostal to inner margin, this line narrowly pale edged distally, and followed below cell by a brownish-drab shade expanding to inner margin; medial space to postmedial line Hay's-brown, wide on costa, narrowing to near postmedial on inner margin, and enclosing the two spots, the orbicular small, oval, oblique, mottled clay-colour and pinkish buff, edged with lilacine white, the reniform large, medially constricted, deep brownish drab, pale-edged and containing a pale upright line; postmedial line light vinaceous-drab, outwardly narrowly edged with fuscous, straight inbent from subcostal to inner margin; terminal space brownish drab crossed by a fine pale line, vertical on costa, outset and somewhat wavy, incurved opposite cell, then slightly outcurved; veins on terminal space partly irrorated with white; a very faint terminal line; cilia blackish brown, with a pale basal line, the tips orange-cinnamon. Hind wing above cinnamon-drab with darker suffusions, the veins benzo-brown; cilia vinaceous-buff. Fore wing below glossy vinaceous-fawn; basal half from below costa to below cell suffused with hair-brown; base of inner margin white; a fuscous postmedial line. Hind wing below whitish, the costal margin broadly vinaceous-buff irrorated with darker scales; an army-brown spot on discocellular; a fawn-colour postmedial line.

Expanse 52 mm.

Habitat.—Joinville, Sta. Catharina, Brazil.
Type.—Cat. No. 34369, U.S. N. M.

Eriopyga motilona, sp. n.

Male.—Head, thorax, body below, and fore wings vinaceous-fawn. Abdomen above: base vinaceous-buff, darker terminally, the anal hairs vinaceous-fawn. Fore wing: a fine, double, subbasal dark line; a similar double antemedial sinuous line interrupted and somewhat punctiform; orbicular formed by a small circular line; a medial hair-brown shade outbent to lower part of reniform, then inbent to inner margin; reniform pinkish buff edged with white, long, narrow, inbent from beyond upper angle of cell; postmedial indicated by black points on veins; subterminal line pale inwardly, darker edged, sinuous, and marked with small velvety-black spots on interspaces to vein 4; cilia with a line of black scales. Hind wing above fawn-colour suffused with hair-brown, cilia vinaceous-fawn. Fore wing below hair-brown, the margins narrowly pale; a fuscous vertical postmedial line. Hind wing below vinaceous-buff, the costal half with dark irrorations; a dark point on discocellular; a fine hair-brown postmedial line.

Expanse 33 mm.

Habitat.—Passa Quatro, Southern Minas, Brazil.
Type.—Cat. No. 34370, U.S. N. M.

Perigea chiuna, sp. n.

Male.—Head and body dull cinnamon-drab. Fore wing avellaneous; a double buffy-brown subbasal line, dentate, indistinct; a fine army-brown line below cell from base to vein 2; antemedial line double, dentate from costa to median, marked by fuscous points; orbicular a small black spot edged with avellaneous and a black line, followed in cell by a fuscous shade to reniform which is large, defined by irregular black edging, and containing an upright fuscous line; veins beyond cell, also submedian, whitish; fine army-brown lines on interspaces to termen between veins 3 and 7; an outer double row of black points on veins; subterminal benzo-brown suffusions, heaviest from vein 4 to tornus; terminal black points on interspaces. Hind wing white, the termen suffused with cinnamon-drab, diminishing towards anal angle.

Expanse 27 mm.

Habitat.—Blumenau, Sta. Catharina.

Type.—Cat. No. 34366, U.S. N. M.

Allied to *P. albistriata* Hampson.

Perigea parnahyba, sp. n.

Male.—Palpi, head, and thorax dull cinnamon-drab. Abdomen drab-grey. Fore wing cinnamon-drab ; a thick subbasal black line ; medial space benzo-brown edged inwardly by the antemedial wavy black line, outwardly by the lunular dentate black postmedial line, which is followed by short black streaks and white points on veins ; orbicular small, reniform fairly large, both cinnamon edged with black ; terminal space suffused with an æneous gloss ; a subterminal benzo-brown shade ; terminal white points. Hind wing whitish, the veins and termen rather broadly suffused with benzo-brown. Wings below duller, the reniform pale.

Expanse 25 mm

Habitat.—Blumenau, Sta. Catharina.

Type.—Cat. No. 34367, U.S. N. M.

The only *Perigea* with cinnamon reniform.

Cropia sigrida, sp. n.

Male.—Palpi : first and second joints fuscous fringed with buffy brown, the third joint buffy brown. Head, collar, and thorax cinnamon-drab mottled with mars-brown and some paler-tipped scales. Abdomen above drab with cinnamon-brown dorsal tufts, underneath pale vinaceous-fawn. Fore wing : anterior portion to postmedial line and base of inner margin dull brownish drab ; traces of darker basal and subbasal lines ; medial portion to postmedial from below cell to inner margin velvety blackish brown, proximally wavily outbent and joined from the costa by an antemedial blackish-brown line, medially deeply excurved in front below cell, again connected with costa by a fine wavy fuscous line passing through end of cell ; reniform slightly paler, but indistinct, containing a dark point ; postmedial line fine, black, outcurved to vein 4, then inbent, followed by a broad white space divided by a dark line and interrupted by a dark shade between veins 4 and 5, this shade expanding below vein 5, forming a velvety fuscous spot, the white portion somewhat obliterated towards costa ; terminal space mottled pinkish cinnamon and wood-brown with some darker wavy streaks ; a fine terminal black line ; cilia sayal-brown mottled with fuscous. Hind wing buffy brown suffused with hair-brown, darkest on termen ; traces of dark postmedial and subterminal lines expanding at inner margin, distinct, bone-brown with a whitish shade between them ; termen narrowly white ; a terminal lunular black line. Fore wing below suffused with buffy brown, the inner margin white ; antemedial and postmedial macular fuscous lines, and a dark subterminal shade. Hind wing below whitish, silky ; some antemedial faint buffy-brown spots ; a small dark spot on discocellular ; a fine broken postmedial line and some large subterminal spots.

Expanse 45 mm.

Habitat.—Sta. Catharina, Brazil.

Type.—Cat. No. 34377, U.S. N. M.

Closely allied to *C. connecta* Smith.

Trachea novicia, sp. n.

Male.—Head, collar, and thorax dark vinaceous-brown, the scales partly warm blackish brown at base. Abdomen warm blackish brown. Fore wing above : base deep slate-violet crossed by an incurved black line, outbent at vein 1, followed by a fuscous shade and white points above and below vein 1 and another in cell ; antemedial shade deep slate-violet edged with black and divided by a fine dark line ; costal margin deep slate-violet with small black spots and lines ; orbicular small, round, slate-violet with pale edge, followed by a quadrate blackish spot to reniform ; median space below cell and vein 3 mottled black and deep slate-violet ; reniform consisting of a central dark lavender line, mottled with purple-brown and fuscous, the whole limited by pale pinkish-buff lines, the outer line more conspicuous and followed by a dark shade to postmedial ; the postmedial line outcurved, black, lunular, followed by a deep slate-violet fascia which is divided by a fine dark line, the veins beyond to subterminal with alternate black and lilacine-white spots; termen dark slate-violet; the subterminal consisting of irregular fuscous spots on interspaces; an interrupted semilunar terminal black line; cilia mottled deep slate-violet and fuscous. Hind wing white, the costal margin broadly dark greyish brown; a dark line on discocellular; a fine outcurved postmedial line; a broad subterminal dark greyish-brown dentate line; an interrupted black terminal line; cilia black tipped with white, light cinnamon-drab at base. Fore wing below white; an outangled medial line; a discocellular spot, a postmedial macular line, and a sinuous subterminal shade, all fuscous. Hind wing below white; a thick antemedial line, a spot on discocellular, a postmedial line outcurved at costa, a subterminal narrow shade, and a fine terminal line all fuscous.

Expanse 30 mm.

Habitat.—Joinville, Sta. Catharina, Brazil.

Type.—Cat. No. 34371, U.S. N M.

Nearest *T. stieglmayri* Zerny, but the hind wing quite different.

Caularis zikani, sp. n.

Male.—Palpi fuscous fringed with pale ecru-drab. Antenna pectinated, black. Head, collar, tegulæ, and dorsal tuft at base of abdomen bay with a few pallid hairs; abdomen dorsally fuscous-black with fine amber-brown segmental lines; anal segment ochraceous-orange; abdomen below pinkish cinnamon; pectus pinkish buff; fore tibia bay, the tarsi black. Fore wing: from median and vein 4 to inner margin dark Indian-red; costal edge mars-yellow; cell and beyond to apex deep heliotrope-grey with scattered Indian-red scales; a basal and a double antemedial fuscous line from costa, defined below cell by heliotrope-grey scales; orbicular and reniform outlined with dark Indian-red, the former round, the latter quadrate; a fine outcurved fuscous postmedial line preceded and followed on costa by small Indian-red spots, this line followed by a finer indistinct and interrupted line; cilia tipped with pale vinaceous-fawn. Hind wing above orange, underneath ochraceous-orange. Fore wing below: cell and costa to terminal space zinc-orange; inner margin pale yellow-orange; termen broadly narrowing to inner margin, etruscan-red; a few similar scales in middle of cell and a thick line on discocellular; a cluster of similar scales below vein 2.

Expanse 40 mm.

Habitat.—Campo Bello, Rio, Brazil.

Type.—Cat. No. 34419, U.S. N. M.

Closely resembles the figure of *Darceta ophideres* Draudt in Seitz, belonging to a different family.

Athysania panoana, sp. n.

Male.—Palpi clay-colour, the fringe tipped with light buff. Head white mottled with cinnamon on vertex. Collar cinnamon mottled with white scales behind. Thorax mottled clay-colour and drab. Abdomen above drab, underneath whitish with some fine chestnut segmental lines. Fore wing cinnamon-drab, the costa, cell, and postmedial space to vein 2 suffused with sayal-brown; fine subbasal, antemedial, and medial darker lines, the subbasal vertical, the antemedial outcurved on costa, the medial outcurved on costa and on inner margin before a broad hair-brown shade; reniform defined by a fine dark line, closely followed by the wavily dentate postmedial line; subterminal line straight, vertical, fine, black, outwardly edged narrowly with white from vein 7 to vein 3; termen vinaceous-buff crossed by a marginal dark line, partly lunular partly dentate; cilia dark shaded according to light. Hind wing dull cinnamon-drab, the termen broadly benzo-brown. Fore wing below fuscous-drab, the inner margin whitish; costal edge vinaceous-cinnamon; cilia pinkish buff. Hind wing below paler, the costa and termen broadly fuscous-drab, narrowing towards anal angle; cilia light buff.

Expanse 38 mm.

Habitat.—Alto da Serra, São Paulo, Brazil.

Type.—Cat. No. 34422, U.S. N. M.

Coxina guinocha, sp. n.

Male.—Palpi and head mottled natal-brown and fuscous. Collar and thorax mottled army- and hair-brown. Abdomen above hair-brown, somewhat paler below. Fore wing: basal third fawn-colour, limited by the antemedial fascia, which is mikado-brown outwardly finely pale-edged, and consists of contiguous spots forming broad lunules, followed in cell by a very small black annulus; medial space narrowly fawn-colour crossed by an irregular fine fuscous line; some fuscous at end of cell; two pale lines at discocellular almost joined medially; outer space to subterminal line largely mottled with fuscous on which the postmedial macular line is very indistinct; before the subterminal from veins 2–6 a narrow drab space with a triple fuscous line cut by the veins; an outbent white line from costa to subterminal at vein 6 encloses with it a large triangular velvety-black spot; subterminal cinnamon-buff at costal spot, then whitish with diffuse grey and cinnamon-buff shading; termen with some fuscous shading; marginal black lines on interspaces outwardly pale-edged. Hind wing dull fawn-colour to beyond middle, crossed by a medial and a postmedial dark line; subterminal line cinnamon-buff preceded by a double series of small black spots, at inner margin surmounted by some cinnamon-buff scaling. Wing below drab, the termen paler with marginal white spots on interspaces, inwardly black-edged; small black spots on discocellulars; a faint darker medial line; a double postmedial line, the outer one more heavily marked, and outwardly pale shaded.

Expanse 33 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 34373, U.S. N. M.

Almost all the species of *Pseudyrias* have the frons and vertex edged by fine white lines, the palpi with lateral white lines, and this is the case with the following apparently new species. There is not much difference in the colour of the body and also great similarity in the colour of the wings; the chief differences consist in the direction of the lines. The species are named after famous musicians:—

A. Postmedial line of fore wing below vein 5 wavily inbent to middle of inner margin.
  a. Postmedial line on hind wing wavy .... *P. dufayi.*
  b. Postmedial line on hind wing slightly sinuous.
    a^1. Postmedial line on hind wing below not edged with white .... *P. gomberti.*
    b^1. Postmedial line on hind wing below edged with white .... *P. arcadetti.*
B. Postmedial line of fore wing not reaching middle of inner margin.
  a. Postmedial line of fore wing vertical opposite cell.
    a^1. Subterminal line of fore wing edged with white. *P. merbecki.*
    b^1. Subterminal line of fore wing not edged with white.................................. *P. grauni.*

b. Postmedial line of fore wing more lunular opposite cell.
  a^1. Hind wing below with antemodial, two medial, and a postmedial line
    a^2. Postmedial line of hind wing lunular .... *P. gallusi.*
    b^2. Postmedial line of hind wing straighter .... *P. farranti.*
c. Postmedial line on fore wing incurved opposite cell.
  a^1. Postmedial line on fore wing below with white points .... *P. tyei.*
  b^1. Postmedial line on fore wing below without white points.............................. *P. villaerti.*

Pseudyrias dufayi, sp. n.

Female.—Body above and wings fuscous-black, suffused with blackish blue. Abdomen above with black transverse lines. Body below benzo-brown. Fore wing: white lines on costa at base and points on terminal third; subbasal and antemedial lines fuscous, partly defined by dull cinnamon shading; a slight medial line interrupted by the orbicular annulus and followed by a second irregular medial line; reniform large, cinnamon-edged, and crossed by black scaling; first postmedial line faint, outcurved around reniform, inbent and double below vein 3, the second line fine, black from subcostal, replaced on costa by a white line, sinuous, incurved slightly opposite cell, outcurved below vein 5 and inbent, sinuous, with white points at veins; a broader fuscous subterminal lunular shade outwardly edged with mikado-brown, and then a dentate fuscous line touching the black terminal crenulate line, the latter with white points on interspaces. Hind wing suffused with mikado-brown at base; faint antemedial and double medial lines; postmedial line double, the inner one faint, the outer well defined black, sinuous with white points; a series of subterminal mikado-brown lunules; terminal line as on fore wing. Wings below benzo-brown. Fore wing: a white spot on discocellular; postmedial line white from costa to vein 7, then with white points on veins; terminal space with a few white irrorations. Hind wing: double antemedial and double medial fuscous lines; postmedial line lunular; termen as on fore wing.

Expanse 29 mm.

Habitat.—Jamaica.

Type.—Cat. No. 34451, U.S. N. M.

Pseudyrias gomberti, sp. n.

Male.—Body above chætura-drab, underneath cinnamon-drab. Fore wing: base snuff-brown; subbasal line light buff on costa, then black, outangled on median, followed by fuscous suffusions in cell and on inner margin; antemedial line light buff on costa, then fine, black, lunular, outcurved; medial space fuscous; reniform 8-shaped filled in and edged with sayal-brown and some greyish scales; postmedial line fine, black, vertical, sinuous from vein 8, slightly outangled below vein 5 and sinuously inbent to middle of inner margin; faint subterminal mottling, expanding from vein 4 to submedian; terminal line fuscous, wavy, and with white points. Hind wing suffused slightly with snuff-brown; postmedial line thick, black, only slightly sinuous edged with sayal-brown, followed by dark neutral grey and a subterminal sayal-brown shade; termen dark neutral grey; terminal small black lunules with white points. Wings below dull cinnamon-drab. Fore wing: a white line on discocellular; faint postmedial white streaks on veins. Hind wing: dark subbasal, antemedial, and double medial darker lines, all very faint; postmedial white streaks on veins; a fine terminal white line on both wings.

Expanse.—Male 27, female 30 mm.

Habitat.—Jalapa, Mexico.

Type.—Cat. No. 34452, U.S. N. M.

Pseudyrias arcadelti, sp. n.

Female.—Body and wings largely suffused with dusky neutral grey. Fore wing: costal margin suffused with snuff-brown and spotted with fuscous; antemedial space from costa to below cell with similar suffusions; a small orbicular edged with black, two black excurved lines on discocellular, and a large space beyond from vein 4 to 8, and to postmedial from vein 6 to 8, cinnamon; postmedial line as in *P. gomberti*; subterminal cinnamon suffusions more reduced than in that species; terminal line fine, black, with light buff points. Hind wing: snuff-brown suffusions between the antemedial and medial line; postmedial line black, sinuous, inwardly edged with sayal-brown; a subterminal broad sayal-brown shade; terminal line as on fore wing. Wings below benzo-brown; faint fuscous lines, antemedial, medial, and postmedial from whitish spots on costa, the postmedial double, lunular, the outer portion better marked, outwardly edged with white scales; a white line on discocellular; a white terminal line; base of cilia white. Hind wing with the lines better defined, the antemedial, medial, and postmedial edged with white on inner margin, the latter so edged throughout; terminal line black, well defined and with white points.

Expanse 32 mm.

Habitat.—Aroa, Venezuela.

Type.—Cat. No. 34453, U.S. N. M.

Pseudyrias merbecki, sp. n.

Female.—Body plumbeous-black above, hair-brown below. Wings largely suffused with blackish violet-grey, the lines black; a wavy terminal black line outwardly pale edged; cilia with large blackish spots separated by cinnamon-drab cilia. Fore wing: a sinuous subbasal line to median, outwardly pale edged; antemedial line fine, sinuous, with some pale scaling on inner edge; a black orbicular annulus followed by a black bar; a white line on discocellular and a small semioval whitish and cinnamon spot below it, both outwardly edged by a fuscous line from costa, incurved and wavily downbent to inner margin; postmedial line black. outbent on costa, vertical and thicker opposite cell, then wavily inbent with outer white spots at subcostal, veins 3, 2, 1, and submedian fold, these spots crossed by fine dark striæ, which also cross the outer edge alternating with fine cinnamon striæ; large subterminal semioval benzo-brown spots, inwardly with white scaling, outwardly with light cinnamon- and benzo-brown striæ; below vein 5 to inner margin the spots are partly obsolescent and are without white. Hind wing: base of costa and cell suffused with mikado-brown; the outer medial line dentate followed by fusous streaks on veins; postmedial line straight from costa, from vein 4 to inner margin slightly sinuous, outwardly edged with alternating striæ, also inwardly before inner margin, these striæ followed by semioval blackish-plumbeous spots outwardly black-edged, and again by alternating striæ; termen blackish-plumbeous, the veins finely irrorated with whitish scales. Wings below similar to those of *P. grauni* Schs.

The male has the postmedial line of fore wing at inner margin as thick as opposite cell, and is outwardly mottled with light mouse-grey from vein 3 to inner margin.

Expanse, male 17 mm., female 18 mm.

Habitat.—St. Jean Maroni, French Guiana.

Type.—Cat. No. 34457, U.S. N. M.

Pseudyrias grauni, sp. n.

Female.—Body above and wings fuscous suffused with dusky slate-violet; terminal line wavy, black, outwardly edged with wood-brown; cilia very crenulate, dusky slate-violet with large black spots. Fore wing: lines black; a basal spot in cell; a subbasal line on costa and in cell; antemedial and medial lines vertical, sinuous, an orbicular black annulus between them; reniform narrow, filled in with cinnamon ending below in a small cinnamon-buff spot; two wavy dusky lines from costa curved around end of cell and downbent to inner margin; postmedial line slightly lunular beyond cell, incurved, sinuous to inner margin, followed by a dark violet-grey shade crossed by vertical light buff striæ; subterminal semilunar benzo-brown spots outwardly edged with cinnamon-drab crossed by fine dark brown vertical lines. Hind wing: base suffused with cinnamon-drab; antemedial line deeply lunular; medial lines crenulate; postmedial line black, sinuous; subterminal spots semilunar, dusky violet-grey preceded and followed by fine vertical light cinnamon-drab and benzo-brown lines. Wings below hair-brown, the lines chætura-drab. Fore wing: a medial, two postmedial, and a subterminal line, the outer postmedial lunular; a pale streak on discocellular. Hind wing: a subbasal, an antemedial, and two medial lines; the postmedial line fuscous, lunular; a fuscous terminal line outwardly pale-edged.

Expanse 31 mm.

Habitat.—Aroa, Venezuela.

Type.—Cat. No. 34456, U.S. N. M.

Pseudyrias gallusi, sp. n.

Female.—Body above chætura-drab suffused with dusky slate-violet. Wings fuscous suffused with dusky slate-violet, the lines black; a crenulate terminal line outwardly edged with drab; a subbasal cinnamon line on costa; antemedial line lunular inwardly edged with cinnamon; a fine medial line, minutely dentate below cell; a double oblique line from costa connected with the double reniform lines, the latter followed by a cinnamon shade; postmedial line outcurved, lunular opposite cell, preceded by a less distinct parallel line, and a slight mikado-brown shade between them from subcostal to vein 6, outwardly finely edged with cinnamon crossed by dark striæ and small white points between the lunules; subterminal black and fuscous blotches with their outer edge lunular, chiefly from veins 8 to 6 and between veins 4 and 3, outwardly edged with cinnamon. Hind wing: costal margin suffused with wood-brown; a broad subbasal fascia; faint traces of an antemedial and two medial lines; postmedial lunular, sinuous, marked as on fore wing; subterminal line cinnamon, lunular edged with fuscous. Wings below buffy brown, the lines benzo-brown more heavily marked on hind wing. Fore wing: lines from middle, oblique, fuscous, below costa much finer; a pale line on discocellular; postmedial outcurved, lunular, outwardly pale-edged; pale points on costa both above and below. Hind wing: an antemedial and two medial lines; postmedial parallel with termen, fine, black, minutely lunular, inwardly edged with benzo-brown; a faint subterminal benzo-brown shade.

Expanse 36 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 34455, U.S. N. M.

Pseudyrias farranti, sp. n.

Male.—Body above fuscous, underneath hair-brown, the tarsi with white rings; wings benzo-brown suffused with dark mouse-grey, the lines black. Fore wing: a fine basal line; subbasal line double; fine pale lines on costa above them; antemedial line fine, wavy; double medial line outcurved around discocellular and downbent below it to inner margin; postmedial from a white line on costa, vertical, wavy, inbent at vein 4 to inner margin, with white points on veins crossed by fine fuscous striæ, and followed partly by hair-brown lunules; subterminal sayal-brown patches, triangular from veins 6 to 3, below 3 lunular; a wavy terminal line, outwardly pale-edged; pale points on costa towards apex; cilia fuscous-black with pale tips. Hind wing: base of costa light buff; faint antemedial and double medial lines; postmedial line slightly sinuous, partly edged with fine light buff and black striæ, followed by a deep violet-grey shade and a broad subterminal sayal-brown shade nearly touching termen; terminal line and cilia as on fore wing. Wings below purplish brown. Fore wing below: pale streaks along costa from middle of wing and two white points before apex; traces of a darker vertical medial line; a light buff streak on discocellular; postmedial line fine, dentate, slightly outcurved. Hind wing: a pale greyish line on discocellular; three faint medial lines; postmedial line better defined, lunular from costa to vein 5, then more dentate, followed by short pale streaks on veins; terminal line on both wings fine, fuscous, outwardly pale-edged.

Expanse 35 mm.

Habitat.—Rio Trinidad, Panama.

Type.—Cat. No. 34454, U.S. N. M.

Pseudyrias tyei, sp. n.

Male.—Body above and wings benzo-brown, the wings suffused with deep violet-grey, the lines black; terminal line wavy with pale scaling outwardly on interspaces; cilia mostly black. Fore wing: a subbasal downangled line; base of costa fuscous crossed by two buffish lines; antemedial line outcurved, lunular; medial line double, well apart on costa, close together at end of cell, faint and broken from cell to inner margin; a small black spot at middle of cell; reniform black-edged, within cinnamon and whitish scaling; postmedial white on costa, then black, wavily outbent, incurved opposite cell, inbent below vein 5, below vein 2 lunular and downbent, outwardly with some dark and pale striæ, and followed by some light drab lunules from costa which suffuse with the subterminal angular and dark lunules below vein 7, these last partly shaded with light cinnamon-drab. Hind wing: antemedial line downbent; medial lines very indistinct; postmedial line black, lunular, wavy, incurved between veins 5 and 2, edged on both sides with fuscous and pale striæ; a subterminal narrow cinnamon shade edged with fuscous, inwardly dentate, outwardly lunular. Wings below dark drab, the lines fine. Fore wing: a white dark-edged line on discocellular; postmedial line outcurved, dentate. Hind wing: a whitish line on discocellular; postmedial line black, with white streaks on veins along its outer edge.

Female.—Wings suffused with greyish blue chiefly adjoining lines. Antemedial line double; subterminal lunules cinnamon-brown edged with fuscous. Hind wing as in male, but of a brighter colour.

Expanse, male 32 mm., female 30 mm.

Habitat.—Male from British Guiana; female from Trinidad.

Type.—Cat. No. 34458, U.S. N. M.

Pseudyrias villaerti, sp. n.

Male.—Very similar to *P. tyei* Schs., but considerably smaller; fore wing darker; postmedial line heavily shaded with black from below vein 2 to inner margin and outbent, not lunular; postmedial line on fore wing below lunular.

Female.—Darker, without the bright suffusions of *P. tyei* female; the subterminal cinnamon-brown lunules not extending below vein 5.

Expanse, male 28 mm., female 27 mm.

Habitat.—Cayuga, Guatemala.

Type.—Cat. No. 34459, U.S. N. M.

Herminodes catharina, sp. n.

Female.—Palpi black, with a broad white streak below. Head, thorax, and abdomen pale vinaceous-fawn. Fore wing above pale vinaceous-fawn irrorated with black scales; costal and inner margin narrowly suffused with benzo-brown; small terminal fuscous spots on interspaces; cilia with some dark mottling. Hind wing above white; some faint, narrow, dark terminal scaling not reaching anal angle. Fore wing below white, the costa and terminal space with some dark irrorations. Hind wing below as above.

Expanse 47 mm.

Habitat.—Blumenau, Sta. Catharina, Brazil.

Type.—Cat. No. 30361, U.S. N. M.

Herminodes velutipuncta, sp. n.

Male.—Palpi fuscous, the third joint above and inwardly white. Head and thorax white. Abdomen light buff. Fore wing light buff with a few scattered wood-brown scales; a black point in cell; a round velvety-black spot on discocellular; faint traces of a lunular subterminal line from costa to vein 4; terminal black spots on interspaces. Hind wing light buff, the termen from apex to vein 2 irrorated rather thickly with wood-brown; a faint dark line on discocellular. Fore wing below light buff with wood-brown irrorations on outer half, forming a subterminal macular line; a small black spot on discocellular. Hind wing below light buff, the costal margin broadly irrorated with wood-brown; the discal spot better defined.

Expanse 32 mm.

Habitat.—Province of Rio de Janeiro.

Type.—Cat. No. 34400, U.S. N. M.

Allied to *H. missionum* Berg.

Herminodes medara, sp. n.

Male.—Palpi blackish brown streaked above with pale pinkish buff. Head and collar pale pinkish cinnamon with a few dark irrorations. Thorax and fore wings buff, with scattered fawn-coloured scales. Abdomen above hair-brown, underneath tilleul-buff. Fore wing: a black subbasal point on subcostal; a dark point at middle of cell; a round fuscous spot at end of cell; an outcurved series of postmedial cinnamon-drab points and a subterminal straighter series of slightly larger points; terminal black spots on interspaces. Hind wing above cinnamon-drab suffused with hair-brown; a dark spot on discocellular; cilia buff. Wings below buff with darker suffusion, especially postmedially; black spots on discocellular.

Expanse 40 mm.

Habitat.—State of Rio, Brazil.

Type.—Cat. No. 34372, U.S. N. M.

Allied to *H. missionum* Berg.

Herminodes anubis, sp. n.

Male.—Palpi drab above, laterally wood-brown tipped with avellaneous. Head olive-buff. Collar and thorax whitish. Abdomen deep olive-buff, darker dorsally. Fore wing pale vinaceous-buff with a few scattered fuscous scales; an irregular pinkish-cinnamon spot, inwardly edged with fuscous on discocellular; an outcurved postmedial series of wood-brown points; a subterminal series of darker points, becoming light pinkish cinnamon toward inner margin and running parallel with termen; small terminal black spots on interspaces. Hind wing light buff, the termen from costa to vein 3 broadly suffused with drab; a small spot on discocellular. Fore wing below largely suffused with drab, the termen broadly pinkish buff; a small black spot on discocellular. Hind wing below pinkish buff; a black linear spot on discocellular; a postmedial drab shade.

Expanse 40 mm.

Habitat.—Province of Rio de Janeiro.

Type.—Cat. No. 34399, U.S. N. M.

Allied to *H. valida* Schaus.

Herminodes bathildes, sp. n.

Male.—Palpi: first and second joints fuscous, the third joint light buff. Head, collar, and tegulæ light buff with a few black scales on tegulæ; thorax black. Body light buff. Fore legs benzo-brown, a light buff circle at end of tibia; mid- and hind tibiæ with long hair-brown hairs. Fore wing light buff irrorated with black scales; an antemedial curved black line in cell followed by a black orbicular point; a double black line at discocellular, the outer line finer; a postmedial series of black spots from vein 7, inbent close to cell, partly suffusing and ending at vein 2; a subterminal series of black spots from vein 7 to vein 4 and a larger spot across fold; a broad antemedial and a medial black spot across vein 1; terminal black spots on interspaces. Hind wing buffish white, the outer half irrorated with drab; a broken black terminal line, partly macular; some slight dark scaling on discocellular. Fore wing below whitish buff; basal two-thirds of costa cinnamon-drab; cell and below to fold suffused with light cinnamon-drab, and similar streaks between veins beyond a faint postmedial macular hair-brown shade; a black orbicular point. Hind wing below whitish buff; costa broadly irrorated with cinnamon-drab; discal spot larger; a faint subterminal macular hair-brown shade.

Expanse 45 mm.

Habitat.—Incachaca, Bolivia.

Type.—Cat. No. 34436, U.S. N. M.

Herminodes guttata, sp. n.

Male.—Palpi benzo-brown, the tip of third joint light buff. Body light buff; fore femora and tibiæ benzo-brown; tarsi fuscous; legs otherwise light buff. Fore wing light buff finely irrorated with cinnamon-buff scales, more densely on interspaces near cell and on terminal space; a short incurved subbasal black line from below costa to below median; a black point as orbicular; a thick black incurved line at discocellular; an antemedial black spot below cell; postmedial slight fuscous markings on interspaces from vein 6 to vein 3, closely followed by more diffuse dark scaling, which extends to costa and inner margin; terminal black spots on interspaces. Hind wing pale pinkish buff, the termen broadly suffused with cinnamon-drab; faint terminal black points on interspaces; cilia light buff. Fore wing below suffused with cinnamon-drab, the inner margin whitish; a fuscous point on discocellular; a subterminal darker shade. Hind wing below light buff well irrorated with fine cinnamon-buff scales; some dark scaling on discocellular; a terminal brownish line on both wings.

Expanse 30 mm.

Habitat.—Quirigua, Guatemala.

Type.—Cat. No. 34435, U.S. N. M.

Cabralia judsoni, sp. n.

Male.—Palpi, head, and thorax fuscous, the latter with a few long pinkish-buff hairs. Abdomen above drab, with transverse fuscous-black lines, laterally and underneath pale cinnamon-pink, with some dark transverse lines on venter. Fore wing: two-thirds of costa from base brownish drab, with a black line on costal edge and a series of black points above subcostal; costa at apex and termen white, the latter rather broadly so, with a marginal and a terminal dark line; the termen preceded by small fuscous spots on interspaces; the median and veins from 2 to costa very broadly white, vein 5 only slightly white, only narrow interspaces remain, mostly drab; cell and below cell to submedian vinaceous-drab, with a black line on discocellular and a fine black line above submedian; inner margin drab, a pale line on submedian and inner margin. Hind wing white, the veins and margins hair-brown, expanding at apex; marginal diffuse white spots. Fore wing below hair-brown; some terminal diffuse whitish markings. Hind wing below white, the veins and a terminal line hair-brown.

Expanse 35 mm.

Habitat.—Huigra, Ecuador.

Type.—Cat. No. 34415, U.S. N. M.

Named after Mr. W. Judson Coxey.

Rejectaria panola, sp. n.

Male.—Palpi, head, collar, and thorax sayal-brown. Abdomen cinnamon-drab. Fore wing: basal third cinnamon-buff crossed by a double, fine, wavily dentate, antemedial line and limited by a narrow, medial, sayal-brown fascia outangled on costa; space beyond to subterminal sudan-brown, crossed by a fine double dentate darker line, outcurved from costa and slightly inbent; a lilacine line on discocellular proximally edged by a black lunule, distally with a small black spot; subterminal line snuff-brown, inbent from apex and slightly sinuous, parallel with termen, outwardly edged with pale gull-grey suffusing with the pale olive-grey terminal space; some sayal-brown suffusions between veins 3 and 5; a wavy terminal fuscous line, partly interrupted; cilia pinkish buff mottled with cinnamon, the tips whitish. Hind wing light brownish drab; a fine darker postmedial line; a dull cinnamon-drab postmedial shade outwardly edged by a fine gull-grey line, and some similar terminal shading chiefly towards anal angle. Fore wing below light brownish drab; a faint discal point and postmedial line; minute white points at costa subterminally. Hind wing below from base to beyond middle pale ecru-drab; a dark discal spot and postmedial line; subterminal line fine, lunular outwardly edged with gull-grey; a fine terminal fuscous line; cilia mottled with fuscous.

Expanse 30 mm.

Habitat.—Castro, Parana.

Type.—Cat. No. 34424, U.S. N. M.

Ipnista tucumana, sp. n.

Female.—Palpi drab fringed with drab-grey. Head, collar, and thorax cinnamon-drab. Abdomen drab, the legs light drab. Fore wing light drab, the markings benzo-brown; a wavy basal line followed by a spot on costa; antemedial double, rather broad, vertical slightly wavy and cut by veins; a double medial line also rather broad, the inner part slightly inbent from costa, interrupted at median and slightly outbent to inner margin, the outer part of line consisting of a spot at end of cell, and a parallel line below cell; postmedial line very fine, fuscous, wavy, outcurved at costa, inbent below vein 3, upturned to median, then vertical to inner margin; a series of subterminal black spots preceded by a benzo-brown shade expanding from below vein 6; termen shaded with benzo-brown; cilia black, with pale tips. Hind wing hair-brown, the base and costal and inner margins dull whitish; cilia pale olive-buff. Fore wing below drab; a faint discal line; postmedial line fuscous, slightly outcurved, broadly followed by hair-brown suffusions. Hind wing below whitish irrorated with drab on costa; a dark spot on discocellular, and an outcurved dark hair-brown postmedial line; some hair-brown suffusions on termen.

Expanse 42 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 34420, U.S. N. M.

[To be continued.]

XXXVII.—*Otoliths of Fishes from the Lower Tertiary Formations of Southern England.—I. Isospondyli, Apodes, Berycomorphi.* By G. Allan Frost, F.L.S., F.G.S.

[Plate XII.]

The fossil otoliths described are from my collection, and have been obtained during the last twenty years from various reliable sources. Many thousands have been submitted to me by R. Egerton-Godwin, Esq., found by him at Barton, Hampshire; others have been received from the late Col. C. E. Shepherd, the late H. Eliot Walton, Esq., and the late Rev. W. H. Webster, all of whom were trustworthy and enthusiastic collectors, and many have been obtained through the courtesy of T. N. Withers, Esq., of the Geological Department of the British Museum of Natural History, South Kensington

The material has been carefully compared with the otoliths of recent fishes in my collection, which contains those of 589 different species, representing 183 families.

In many genera the characteristic features had become fixed in Eocene times, and have remained constant down to the present day, e. g., *Pagellus*, *Pagrus*, *Cepola*, *Apogon*, *Trachinus*, and *Pseudoscarus* of the order Percomorphi, *Polymixia*, *Beryx*, and *Myripristis* of the order Berycomorphi, and *Arius* of the order Ostariophysi. Of the order Anacanthini, *Merluccius* is an outstanding example.

With the form well marked, but somewhat less fixed and more varied, are numerous otoliths of the highly specialized family Ophidiidæ, of which eleven species are to be described.

Apodal otoliths are frequent in the Barton beds, and their features are more generalized than in those of recent species. Otoliths of *Anguilla* are conspicuous by their absence.

If we may judge by the relative sizes of the otoliths of recent species, the majority of those from Barton are of immature fish, many being of the smallest size; for instance, those of *Beryx* do not exceed 4½ mm. across, whereas those of a 3 lb. example of the recent species measure 20 mm.; those of *Gadus* indicate fishes of 4 to 5 inches in length, and those of *Solea* examples of 1 to 3 inches.

A possible explanation of the large deposits of small otoliths, and the absence of other fish-remains in these beds, may be that sharks and large predatory fishes were present in the Bartonian seas, that the otoliths are derived from their excreta, and that the remaining parts of the fishes on which they preyed were destroyed in the process of digestion.

Otoliths of fishes of the order Percomorphi are numerous, and there are 31 species to be described; of the suborder Clupeoidea there are 7, of the order Apodes 11, and of the Berycomorphi 4.

In the order Anacanthini examples of *Macrurus*, *Gadus*, and *Merluccius* occur, and of the Heterosomata *Bothus*, *Pleuronectes*, and *Solea*. The order Ostariophysi is represented by the lapilli of four species of Ariidæ.

The otoliths from the London Clay resemble the Barton examples in size, with the exception of some percoid examples of medium proportions, but in the Blackheath beds of Abbey Wood, Kent, exceptionally large examples of otoliths of *Albula* occur, which far exceed in size any others hitherto described from the English tertiaries.

I wish to acknowledge with many thanks the assistance I have received from Dr. C. Tate Regan, F.R.S., Director of the British Museum (Nat. Hist.), who has kindly read and corrected this paper.

Order ISOSPONDYLI.

Otolithus (*Elops*) *eocenicus*, sp. n.
(Pl. XII. fig. 1.)

Shape long, ovate; dorsal and ventral rims curved, anterior rim pointed, posterior rim rounded. Sulcus straight, undivided, opening on anterior rim. Resembles primitive forms from the Jurassic *.

A single specimen, 2 × 1 mm., from the Lower Eocene, London Clay, Isle of Sheppey.

Otolithus (*Elops*) *rectus*, sp. n.
(Pl. XII. fig. 2.)

Shape long, drop-like. Sulcus straight, undivided, opening on the anterior rim above the long pointed rostrum. Resembles that of the recent species *Elops hawaiensis* †, but differs in the pointed posterior rim.

Two specimens, 4 × 2 mm., from the Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Argentina*) *erectus*, sp. n.
(Pl. XII. fig. 3.)

Shape subcircular, flat; dorsal rim high, truncated anteriorly, ventral rim keeled, posterior rim rounded, anterior rim vertical; rostrum wide, point missing. Sulcus straight, with upper and lower angles, opening on rostrum; ostium wide; cauda with rounded end, not reaching posterior rim. Resembles that of the recent species *Argentina silus*; it differs in the anterior truncation of the dorsal area and in the enclosed end of the cauda.

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* G. Allan Frost, "Otoliths of Fishes from the Upper Kimmeridgian of Buckinghamshire and Wiltshire," Ann. & Mag. Nat. Hist. ser. 9, vol. xiv. p. 139, pl. v. (1924).

† G. Allan Frost, "A Comparative Study of the Otoliths of the Neopterygian Fishes," Ann. & Mag. Nat. Hist. ser. 9, vol. xv. p. 153, pl. xi. fig. 1 (1925).

Two specimens, $6\frac{1}{2} \times 5\frac{1}{2}$ mm., from the Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Clupeidarum*) *altus*, sp. n.
(Pl. XII. fig. 4.)

Shape subcircular; dorsal rim high anteriorly, ventral rim keeled, posterior rim rounded, anterior rim vertical, with low blunt rostrum. Sulcus wide, straight, undivided, nearer to the ventral rim than to the dorsal rim, end rounded, not reaching posterior rim.

A single specimen, $7 \times 5\frac{1}{2}$ mm., from the Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Clupeidarum*) *dilatus*, sp. n.
(Pl. XII. fig. 5.)

Shape subcircular, thick; dorsal rim high, ventral rim shallow, curved. Sulcus horizontal, with lower angle, opening on anterior rim; ostium wide; cauda narrow, shorter than ostium, not reaching posterior rim. Resembles that of the recent species *Clupea sprattus* (Frost, 1925, vol. xv. pl. xi. fig. 6).

Three specimens, 1×1 to 2×2 mm. Oligocene, Bembridge Marls, Gurnard Bay, Isle of Wight.

Otolithus (*Albula*) *bartonensis*, sp. n.
(Pl. XII. fig. 6.)

Shape roughly ovate; outer side concave, inner side convex; dorsal area situated on posterior half of the low dorsal rim, the anterior half of which is occupied by the sulcus; ventral rim slightly curved, forming an angle with anterior rim; posterior rim small, rounded, passing into ventral rim. Sulcus opening widely on dorsal rim; ostium wide, shallow; cauda deep, downturned, with pointed end that reaches ventral rim. Resembles that of the recent species *Albula vulpes* (Frost, *t. c.* pl. xi. fig. 8).

A single specimen, 11×7 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Albula*) *eppsi* White & Frost [*].

(Pl. XII. fig. 7.)

Resembles *O.* (*Albula*) *bartonensis*, but differs in the unbroken curve of the anterior and ventral rims, and in the greater thickness of the otolith.

Thrity-nine specimens, 11 × 6 to 16 × 10 mm., holotype P. 15287, Brit. Mus. Nat. Hist. Lower Eocene, Blackheath Beds, Abbey Wood, Kent.

Order APODES.

Otolithus (*Congridarum*) *bartonensis*, sp. n.

(Pl. XII. fig. 8.)

Shape ovate, rather flat; dorsal rim low, with median depression, ventral rim curved, posterior rim broad, rounded, forming an angle with dorsal rim, anterior rim rounded. Sulcus curved, upper margin short, curving upwards; ostium distended; cauda narrow, ending in a shallow depression. Resembles *O.* (*Conger*) *elongatus* Sulc [†]. It differs in the depression present on the dorsal rim, in the higher position of the angle on the posterior rim, and in the extension of the ostium to the anterior rim.

A single specimen, 6 × 3½ mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Congridarum*) *ovatus*, sp. n.

(Pl. XII. fig. 9.)

Shape ovate, biconvex, thick; dorsal rim short, curved, passing into the rounded posterior rim, ventral rim curved, anterior rim with flat-ended rostrum, upper margin of rostrum concave. Sulcus oblique, wide, undivided, opening between rostrum and dorsal rim; end of cauda broad and angular. This form differs from *O.* (*Congridarum*) *bartonensis* in the rounded dorsal rim, in the wider posterior rim, and in the broad oblique sulcus.

Four specimens, 5 × 3 to 8 × 4½ mm. Upper Eocene, Barton Beds, Barton, Hampshire.

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[*] E. I. White, 'Vertebrate Faunas of the British Eocene,' Brit. Mus. Nat. Hist. 1931.

[†] Jaroslav Sulc, "Les Otolithes du Paléogène des Environs de Biarritz," Rozpravy Stat. geol. istavu Csl. vol. vii. p. 61, pl. i. fig. 9 *b* (Prague, 1932).

Otolithus (*Congridarum*) *websteri*, sp. n.

(Pl. XII. fig. 10.)

Shape irregular; dorsal rim straight, with small elevation above the rounded posterior rim, ventral rim angular, anterior rim with blunt rostrum. Sulcus resembling that of the recent species *Uroconger lepturus* (Frost, 1926, xvii. pl. iv. fig. 11).

A single specimen, 3 × 1½ mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Congridarum*) *eocenicus*, sp. n.

(Pl. XII. fig. 11.)

Shape ovate, outer side concave, inner side convex; dorsal rim low, curved, ventral rim curved, posterior rim with small rectangular process containing a circular depression, anterior rim with upturned rostrum. Sulcus wide, oblique, with lower angle, ostium opening between rostrum and dorsal rim. Sulcus as in the recent species *Conger vulgaris* (Frost, 1926, xvii. pl. iv. fig. 10), but differing in the extension of the ostium to the anterior rim.

Five specimens, 6 × 3 to 8½ × 5 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Congridarum*) *pantanelli* Bassoli & Schubert.

(Pl. XII. fig. 12.)

Otolithus (*Ophidium*) *pantanelli* Bassoli & Schubert, 1906 *.

Shape ovate, biconvex; dorsal and ventral rims curved, posterior rim small, rounded, anterior rim blunt. Sulcus slightly oblique, undivided, not reaching to point of rostrum, upper edge short, lower edge straight, end of cauda rounded, resembling the sulcus of the recent species *Uroconger lepturus* (Frost, *t. c.* pl. iv. fig. 11), but more oblique.

Numerous specimens, av. 4½ × 3 mm. Upper Eocene, Barton Beds, Hampshire.

Otolithus (*Uroconger*) *transversus* Sulc.

(Pl. XII. fig. 13.)

Sulc. *t. c.* p. 60, pl. i. fig. 8.

Resembles *O.* (*Congridarum*) *pantanelli*, but differs in the lower position of the sulcus and in the height of the anterior part of the dorsal rim.

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* G. G. Bassoli, "Otoliti fossili terziari dell' Emilia," Rivista Italiana di Paleontologia, Anno xii. Fasc. 1, p. 43, Tav. 1, fig. 41–42 (Perugia, 1906).

Described by Sulc from the Bartonian of Biarritz.

A single specimen 3½×2½ mm. Middle Eocene, Bracklesham Beds, Alum Bay, Isle of Wight.

Otolithus (*Congridarum*) *attenuatus*, sp. n.
(Pl. XII. fig. 14.)

Shape long, subovate, biconvex; dorsal rim low, curved, ventral rim curved, deepest anteriorly, posterior rim small and extended, anterior rim with blunt rostrum. Sulcus oblique, undivided, opening on upper part of rostrum; end narrow and rounded, terminating near centre of otolith.

A single specimen, 6½×3 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Ophichthys*) *acutus*, sp. n.
(Pl. XII. fig. 15.)

Shape leaf-like, biconvex; dorsal rim straight, with posterior angle, ventral rim curved, posterior rim acutely pointed, anterior rim with blunt rostrum. Sulcus oblique, undivided, with rounded end, terminating behind the centre of the otolith; upper margin of ostium absent, lower margin continued to point of rostrum. Resembles in general appearance that of the recent species *Ophichthys gomesii* (Frost, *t. c.* pl. iv. fig. 12).

One specimen, 4×2 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Murænosox*) *minimus*, sp. n.
(Pl. XII. fig. 16.)

Shape ovate, biconvex; dorsal and ventral rims curved, posterior rim oblique, lower part indented, anterior rim consisting of a broad upturned rostrum. Sulcus oblique, without angles; ostium shallow, extending to anterior rim; cauda short, with rounded end. Resembles that of the recent species *Murænosox talabon* (Frost, *t. c.* pl. iv. fig. 8).

One specimen, 2½×1½ mm. Lower Eocene, London Clay, Isle of Sheppey.

Otolithus (*Congridarum*) *furcatus*, sp. n.
(Pl. XII. fig. 17.)

Shape irregular, biconvex; dorsal rim curved, posterior rim furcated, anterior rim consisting of two rounded processes. Sulcus short, oblique, enclosed, occupying centre of otolith. Resembles that of the recent species *Conger vulgaris* in the furcated posterior rim and in the position of the sulcus.

Two specimens, 4½ × 2 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Myrus*) *caudatus*, sp. n.
(Pl. XII. fig. 18.)

Shape elongate; dorsal rim low, regular, ventral rim curved, posterior rim with upper part produced, lower part curved, passing into the ventral rim, anterior rim vertical. Sulcus undivided; cauda curved, with broadened end reaching to ventral rim.

Resembles that of the recent species *Myrus vulgaris* (Frost, *t. c.* p. 100, pl. iv. fig. 5), but differs in the vertical anterior rim, in the straight lower margin of the ostium, and in the length of the cauda.

One specimen, 5 × 2 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Congromurœna*) *amoris* Sulc.
(Pl. XII. fig. 19.)

Sulc, *t. c.* p. 62, pl. i. fig. 10.

Shape rhombic; dorsal rim high, ventral rim keeled, deepest anteriorly, posterior rim oblique and pointed, anterior rim rounded. Sulcus horizontal, opening on anterior rim; cauda small and dilated. Resembles that of the recent species *Congromurœna balearica* in shape, but differs in the open ostium.

Described by Sulc from the Bartonian of Biarritz.

Five specimens, 3 × 2½ to 4 × 3 mm. Upper Eocene, Barton Beds, Barton, and Biarritz.

Order BERYCOMORPHI.

Otolithus (*Polymixia*) *eocenicus*, sp. n.
(Pl. XII. fig. 20.)

Shape ovate; dorsal rim pointed, ventral rim keeled, deepest anteriorly, posterior rim rounded, anterior rim oblique. Sulcus divided, with angle on lower margin, opening on upper part of anterior rim, ostium upwardly inclined, cauda straight, extending to posterior rim.

Resembles that of the recent species *Polymixia japonica* (Frost, 1927, xix. pl. viii. fig. 1), but differs in the straight cauda.

Three specimens, 4×3½ to 6×4 mm. Lower Eocene, London Clay, Worcester Park, Surrey.

Otolithus (*Berycidarum*) *bartonensis* Schubert.
(Pl. XII. fig. 21.)

Otolithus (*Beryx*) *bartonensis* R. J. Schubert, 1915 *.

Described by Schubert from the Upper Eocene of Barton.

Numerous specimens up to 8×5½ mm.

Otolithus (*Beryx*) *eocenicus*, sp. n.
(Pl. XII. fig. 22.)

Shape pentagonal, both sides flat; dorsal rim low, forming angles with the anterior and posterior rims, ventral rim keeled, deepest anteriorly, posterior rim vertical, anterior rim curved. Sulcus enclosed, in the example figured, but in other specimens open, as in *Polymixia*, angle on lower margin, ostium upturned, cauda oblique, end distended, reaching posterior rim.

Resembles that of the recent species *Beryx splendens* (Frost, *t. c.* p. 441, pl. viii. fig. 2).

Eight specimens, up to 5×4 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

Otolithus (*Myripristis*) *priemi* Schubert.
(Pl. XII. fig. 23.)

Otolithus (*Sciænidarum*) *priemi* R. J. Schubert, 1915, *t. c.* p. 281, Taf. vii. fig. 16.

Resembles that of the recent species *Myripristis murdjan* (Frost, *t. c.* p. 442, pl. viii. fig. 7).

Six specimens, 3½×2 to 4½×3 mm. Upper Eocene, Barton Beds, Barton, Hampshire.

EXPLANATION OF PLATE XII.

Fig. 1. *Otolithus* (*Elops*) *eocenicus*, sp. n.
Fig. 2. —— (——) *rectus*, sp. n.
Fig. 3. —— (*Argentina*) *erectus*, sp. n.

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* R. J. Schubert, "Obereocäne Otolithen vom Barton Cliff bei Christchurch, Hampshire," Jahrb. der k. k. Geol. Reichsanst. vol. lxv. pp. 277–288, Taf. vii. fig. 18 (Wien, 1915).

Fig. 4. ***Otolithus (Clupeidarum) altus*, sp. n.**
Fig. 5. —— (——) ***dilatus*, sp. n.**
Fig. 6. —— ***(Albula) bartonensis*, sp. n.**
Fig. 7. —— (——) *eppsi* White & Frost.
Fig. 8. —— ***(Congridarum) bartonensis*, sp. n.**
Fig. 9. —— (——) ***ovatus*, sp. n.**
Fig. 10. —— (——) ***websteri*, sp. n.**
Fig. 11. —— (——) ***eocenicus*, sp. n.**
Fig. 12. —— (——) *pantanelli* Bass. & Schubert.
Fig. 13. —— *(Uroconger) transversus* Sulc.
Fig. 14. —— ***(Congridarum) attenuatus*, sp. n.**
Fig. 15. —— ***(Ophichthys) acutus*, sp. n.**
Fig. 16. —— ***(Murænosox) minimus*, sp. n.**
Fig. 17. —— ***(Congridarum) furcatus*, sp. n.**
Fig. 18. —— ***(Myrus) caudatus*, sp. n.**
Fig. 19 —— *(Congromuræna) amoris* Sulc.
Fig. 20 —— ***(Polymixia) eocenicus*, sp. n.**
Fig. 21. —— *(Berycidarum) bartonensis* Schubert.
Fig 22. —— ***(Beryx) eocenicus*, sp. n.**
Fig. 23. —— *(Myripristis) priemi* Schubert.

XXXVIII.—*Descriptions of a few new Species of American* Platypodidæ *in the British Museum of Natural History.*

By KARL E. SCHEDL.

BY the courtesy of the British Museum of Natural History I have been given the opportunity of examining their unidentified Platypodidæ originating from America. The great bulk consist of already described forms, but a few are new and are described in the following pages.

PLATYPUS Herbst.

Platypi coronati.

Platypus equadorensis, sp. n.

Description of the male beetle.

Dark reddish brown, 4·9 mm. long, 3·1 times as long as wide, pronotum slightly longer than wide (18 : 17), elytra distinctly wider (17 : 19) and nearly twice as long as the pronotum (18 : 35).

Front plane, slightly depressed below, coarsely sparsely punctured on the shining anterior half, a short median sulcus at the centre, posterior half subopaque, on the lower part densely finely punctured, towards the vertex the punctures decreasing in size, the surface becoming rather rugulose; vertex with a few coarse punctures; frons rather sparsely hairy.

Pronotum brightly shining, median sulcus distinct on the basal third, lateral emarginations shallow, surface very sparsely and minutely punctured.

Elytra striate-punctate, humeral angles moderately rounded, sides feebly arcuate, widest behind the middle, apex as in *P. longulus* Chap.; striæ somewhat impressed, but the punctures not confluent; interstices convex, first very narrow, with 4 or 5 remotely placed punctures, others distinctly wider, third widest, all with a not quite regular row of fine punctures, the interstices 1, 3, 5, 7 carinate towards the declivity and terminating in spines, those of the first and seventh weakly developed and equal in length, third longest, fifth slightly shorter, carinate parts devoid of granules or punctures; declivital face oblique, rugulose, produced into one process on each elytron as in *P. longulus*; process very slender, with indications of three terminal denticles.

Description of the female beetle.

The same colour as the male, 4·9 mm. long, 3·1 times as long as wide, pronotum quadrate, elytra wider (17 : 18·5) and 2·15 times as long as the pronotum.

Front plano-concave, subshining in front, dull above, medially with a short, impressed, shining sulcus, finely transversely punctured, more sparsely above the epistomal margin, devoid of hairs except on the margins; vertex shining, with a row of coarse, remotely placed punctures along the front margin and numerous fine punctures on the whole area.

Pronotum subnitid, anterior angles of the lateral emarginations produced (widest part of the pronotum), parts anterior to the emarginations parallel, posterior angles of the emarginations not visible but gradually curving into the sides; median line feebly impressed on more than the posterior third; a pair of very remotely placed small pores at the anterior extremity; surface rather sparsely inconspicuously punctured.

Elytra cylindrical, humeral angles rounded, sides subparallel, slightly arcuate, obtusely rounded behind; surface subshining, finely striate-punctate, striæ hardly impressed except the sutural stria, which is distinctly so; interspaces flat, with a row of minute punctures, third interspace greatly widened at the base, occupying nearly the area of three interstices, with densely placed fine asperities, fourth and fifth interstices with a few fine rugosities; declivity convex, apical depression hardly noticeable, flat, dull, whole declivity without regular striæ but with scattered red, minute, setose tubercles. Anterior tibiæ with closely placed numerous, fine, transverse rugosities.

Holotype, male, bears the label "Ecuador, Cachabe, low country, Nov. 1896" (*Rosenberg*).

Allotype, female, same label.

Types in the British Museum of Natural History.

This species should be placed near *P. acutidens* Blandf., from which it is easily separated by the longer and pointed apical process.

Platypi plicati.

Platypus costipennis, sp. n.

Description of the male beetle.

Nearly black, 4·6 mm. long, not quite three times as long as wide (57 : 16), pronotum 1·2 times as long as wide, elytra distinctly wider (14 : 16) and 1·85 times as long as the pronotum.

Front plane, very slightly depressed below, subshining, densely roughly punctured, but only slightly more finely towards the vertex.

Pronotum with the lateral emarginations moderately deep, median sulcus impressed on the posterior third, feebly indicated anteriorly, densely punctured on the anterior two-thirds, punctures irregular in size but fine, shining, and sparsely punctured at both sides of the sulcus, roughly, densely puuctured at the base.

Elytra at the base as wide as the pronotum, widest shortly before the commencement of the declivity, base elevated, carinate, humeral angles feebly rounded, sides slightly arcuate, diverging towards the declivity, truncate behind; disc deeply sulcate, sulci multipunctate, interstices carinate, much narrower than the sulci, carinæ not reaching the base, the third, fifth, seventh subconvex there, the third feebly widened and with a row of four to six fine tubercles, two similar tubercles on the fourth and one on the fifth interstice, the other finely densely punctured, humeral angle finely reticulate, subimpunctate; the first four alternate interstices terminating in spines at the commencement of the declivity, fifth and seventh subequal in length and development, third largest, extending far beyond the others and as far back as the apical margin of the elytra when viewed from above, first with the spine nearly obsolete, gradually declivous, declivital face convex, opaque, with shining punctures, postero-lateral angles produced downwards in the plane of the declivity, median emargination convex; fourth abdominal sternite strongly produced, with two large spines, last sternite concave. Free border of the posterior femoral recess subserrate, with a single spine on the metasternum and two spines on the metepisternum.

Description of the female beetle.

Reddish brown, head, pronotum, and apex of the elytra darker, 5·1 mm. long, 4·4 times as long as the width of the pronotum, the latter 1·13 times as long as wide, elytra distinctly wider and 2·37 times as long as the pronotum.

Front plane, feebly elevated between the antennæ, shining, finely but deeply and sparsely punctured above the epistomal margin, punctures much coarser on the median third, towards the vertex opaque, finely punctured, and with short yellow hairs.

Pronotum with the lateral emarginations rather deep, surface subshining, median sulcus little longer than the posterior third, at the anterior extremity with two very large pores which are separated by a space much less in width than the diameter of one pore, around the pores with a group of coarse deep punctures, on the anterior two-thirds densely finely punctured, punctures much more sparsely placed near the sides.

Elytra with the sides parallel, narrowed behind, disc very finely lineate-punctate, first and third interstices very feebly convex, others plane, all impunctate, base of the third widened, elevated, with numerous fine asperities, short before the declivity, the first and third interstices little more distinctly convex, all interstices feebly rugose and hairy, the third interstice terminating in a blunt process, the lateral interstices conjoined to a similar process of equal length, declivity face perpendicular, impressed, subopaque, with a long blunt process at both sides of the suture. Abdominal sternites shining, finely sparsely punctured.

Holotype, male, bears the label "Mexico (Truqui), Fry Coll."

Allotype, female, same data.

This species is certainly closely allied to *P. marginatus* Chap. and *P. imporcatus* Blandf., but is easily distinguished from both by the spinose fourth abdominal sternite and the characters of the declivity.

Platypi trispinati.

Platypus foraminosus, sp. n.

Description of the female beetle.

Dark reddish brown, 4·8 mm. long, 4·2 times as long as wide, pronotum 1·2 times as long as wide, elytra nearly twice as long as the pronotum (17 : 33). Closely allied to *P. rudifrons* Chap., which is smaller, has the puncturation of the elytra finer, and the interstices hardly convex.

Front plane, opaque and impunctate on the anterior half, transversely strigose towards the vertex. The antennæ as in *P. rudifrons*.

Pronotum shining, lateral emarginations shallow, median line strongly impressed on the posterior third, pores smaller, as in *rudifrons*, surface finely and sparsely punctured, except for a group of punctures at both sides of the sulcus, which are rather coarse.

Elytra with the sides subparallel, converging after the basal three-fourths, truncate behind; strongly striate-punctate, all striæ more or less impressed, interstices convex, towards the sides becoming flatter, impunctate, base of the third interstice widened and transversely rugose on a rather long area.

Holotype, Rio Janeiro, Brazil: Brit Mus. Nat. Hist.

A specimen from British Guiana, Cattle Trail Survey, Canister Falls, Nov. 1919 (A. A. Abraham Coll.) has the same general appearance, but the elytral interstices are less convex, the striæ less inpressed, and the strial punctures finer. Until more material is available this specimen may also be assigned to this species.

Platypi sulcati.

P. pulcher Chap., Rio Janeiro, Brazil (Fry Coll.). The male of this species was hitherto unknown. A specimen which I believe is the male is described below.

Platypus pulcher, ♂.

Dark reddish brown, 4·0 mm. long, 3·5 times as long as wide, pronotum little longer than wide (15 : 14), elytra nearly twice as long and as wide as the pronotum.

Front feebly concave, shining, rather sparsely but coarsely punctured on the anterior half, plane, subopaque, and densely punctulate above, angle separating frons and vertex rather acute. Antennal scape distinctly wider than long, but not so extremely developed as in the female.

Prothorax shining, lateral emarginations shallow, median impressed line short, situated as in the female, densely punctured.

Elytra shining, sides subparallel, at the commencement of the declivity strongly constricted as in some of the Platypi plicati, truncate and bisinuate behind when viewed from above; disc striate-punctate, punctures shallow, subconfluent in parts, all interstices narrowly carinate, with scattered fine punctures, third interstice widened at the base and with numerous fine transverse rugosities, the fourth and fifth also with fine tubercles; declivity opaque, oblique in the upper part, nearly perpendicular below, postero-lateral angles produced, the oblique part finely rugose and with some indications of the interstices. Last abdominal sternite with a strong median tubercle on the caudal border.

Platypi incertæ sedis.

Platypus dubiosus, sp. n.

Description of the male beetle.

Piceous, 6·6 mm. long, 3·2 times as long as wide, pronotum quadrate, elytra distinctly wider (22 : 25) and 2·2 times as long as the pronotum.

Front plane, transversely elevated between the antennæ, epistomal margin polished, with deep transverse punctures, remaining surface opaque, longitudinally densely strigose and rather densely hairy, median line impressed between the antennæ.

Pronotum brightly shining, lateral emarginations hardly noticeable when viewed from above, median line impressed on the posterior third, anterior two-thirds sparsely punctured, punctures irregular in size, densely roughly punctured near the base.

Elytra with the base carinate, sides arcuate, diverging towards the declivity, widest at the middle, restricted behind, very broadly rounded at the apex; disc cylindrical, striate-punctate, all striæ deeply impressed; punctures indistinct, confluent, interstices convex, the first uniseriately tuberculate throughout, the others finely, irregularly, but not sparsely punctured; declivity uniformly rounded, towards and on the declivity all interstices with densely placed setose tubercles, declivital face applanate on the lower part, side margins of the applanation acute, slightly produced when seen from above, somewhat as in *P. subsulcatus* Chap., the third interstice with a large tubercle on its upper limits, surface densely rugose. Abdominal sternites densely coarsely punctured and covered with long yellow hairs.

Holotype, male, Brazil, Rio Janeiro, Fry Coll. in the Brit. Mus. Nat. Hist.

I cannot place this species satisfactorily in any of Chapuis' groups. The elytra resemble those of the Platypi sulcati and discoidales; the longitudinally strigose front does not fit in either group.

Platypus discoidalis, sp. n.

Description of the male beetle.

Uniformly dark brown, 5·14 mm. long, 3·1 times as long as wide. The species should be placed between *P. obtusus* Chap. of the Platypi sulcati and the *P. discicollis* Chap., *P. limbatus* Chap., and *P. biformis* Chap. of the Platypi discoidales. It is easily separated from these species by the size, colour, and declivity of the elytra.

Front subconcave, areolate, and rugose, becoming obliterated towards the vertex. Antennal scape distinctly wider than long.

Pronotum longer than wide (49 : 41), lateral emargination shallow, median sulcus short, not extending to the base, continued on the median third of the pronotum by a line of densely placed punctures, remaining surface shining, minutely reticulate, with moderately densely placed punctures, very sparse at the sides of the sulcus, coarser near the base.

Elytra at the base as wide and twice as long as the pronotum, sides slightly diverging towards the declivity, base finely carinate, broadly rounded, subtruncate behind. Sulcate and multipunctate throughout; interstices similar, carinate, on the disc with scattered fine punctures, numerous near the base, third interstice at the base slightly enlarged and with a few fine transverse rugæ; declivity convex, lower part perpendicular, subconcave; on the convex upper portion all the interstices very narrow, each with a row of small setose tubercles, first and second gradually decreasing in size, gradually sloping down to the perpendicular face, third to seventh interstices forming a transverse carina at the upper limit of the truncate portion, in the prolongation of the third a prominent tubercle, in that of the sixth and seventh a blunt small tooth. Perpendicular face rugosely punctured, without trace of striæ or interstices. Abdomen convex, without armature.

Holotype, one male, which bears the label "British Guiana, Essequibo R., Moraballi Creek, 15. viii. 1929, Oxford Univ. Exped."

Type in the British Museum of Natural History, London.

XXXIX.—*Observations on the Pectoral Musculature of Amphibia Salientia.* By E. Idris Jones, M.Sc.(Lond.).

A. The Variability of the Musculature in relation to the Reduction of the Clavicle, Procoracoid, and Episternum.

Several frogs of the families Ranidæ and Brevicipitidæ have undergone a reduction in the anterior elements of the breast-shoulder apparatus. The degree of reduction varies. It may take the form of a reduction of the clavicle only, the procoracoid remaining well developed, as in *Oreophryne variabilis* Boulenger; or complete loss of the clavicle, the procoracoid still remaining well developed, as in *Genyophryne thomsoni* Boulenger; or, finally, to complete loss of clavicle and procoracoid, as occurs in *Cacosternum boettgeri* Boulenger, *Cophixalus verrucosus* Boulenger, and others. The episternum may be so reduced that it is only represented by a small plate of cartilage situated on the anterior ends of the epicoracoids, as in *Microhyla pulchra* (Hallow).

When a skeletal element is reduced it may be so apparently due to lack of function or due to factors, at present little understood, acting from within the organism (Dobson, 1885). The functions usually assigned to the clavicle and procoracoid are :—(*a*) they act as a strut to keep the shoulder at the side of the body, and (*b*) they afford attachment to muscles.

In the Firmisternia, in which the coracoid is well developed, this strut-like function is almost entirely taken over by this element. In *Hemisus marmoratum* (Peters) the coracoids are thin and slender and pass down to meet at an acute angle over the abdomen. The mechanical strut-like function of the coracoids would thus be obviously diminished, and in correlation with this, it is found that the clavicles are remarkably stout and well formed, and have apparently taken over the mechanical functions of the coracoids. Similarly, in *Xenopus lævis* Daud. Rain. the coracoids meet at an acute angle and the clavicles are found to be very stout. In most Firmisternal Amphibia then it appears that the mechanical functions of the clavicles are in abeyance. In the Arcifera, where the overlapping of the epicoracoids prevents the coracoids from having this function, the clavicles assume it. Although not remarkably stout in this group, it is noteworthy that the clavicles are never reduced or lost, whereas reduction in the Firmisternia is common. It thus appears that the reduction of these elements is probably due to their loss of mechanical function.

The relation between the degree of reduction of the clavicle, procoracoid, and episternum and the muscles arising therefrom is considered in this paper.

As numerous synonyms exist for the various muscles, the following table is given for convenience, the names used by the present author being in italics :—

M. *Pectoralis* (Ecker and Gaupp).

(*a*) Pars epicoracoidea = Clavi-humeral (Dugès).
= *Supracoracoideus superficialis.*

(*b*) *Pars sternalis* =Sterno-humeral (Dugès).
(*c*) *Pars abdominalis* =Abdomino-humeral (Dugès).

M. Deltoideus (Ecker and Gaupp).
=Présternoscapulohuméral (Dugès).
=Episternocleidoacromiohumeralis (Fürbringer).
(*a*) Pars scapularis =*Acromio-humeralis.*
(*b*) Pars omosternalis =*Episterno-humeralis.*
(*c*) Pars clavicularis =*Cleido-humeralis.*

M. *Coraco-radialis* (Ecker and Gaupp).
=Sterno-radialis (Ecker).
=Présternoclavihuméral (Dugès).
=Coraco-radialis proprius (Fürbringer).

M. *Coraco-brachialis longus.*
=Coraco-humeralis.

M. *Coraco-brachialis brevis* (Ecker and Gaupp).
=Subscapularis (Ecker).
=Sous-scapulo-huméral (Dugès).
=Coraco-brachialis brevis internus (Fürbringer).

A brief account of the pectoral musculature of *Rana esculenta* is given here for comparison with the other forms :—

Rana esculenta L. (Ecker and Gaupp, 1896).

Clavicle and episternum well developed. Procoracoid hidden by clavicle.

M. *Supracoracoideus superficialis.*—Arises from the epicoracoid and the medial end of the coracoid. It partially covers the Coraco-radialis and passes laterally to be inserted near the proximal end of the *Crista ventralis humeri.*

M. *Pectoralis.*—(a) *Pars sternalis.* Arises from the lateral border of the mesosternum and from the cartilaginous xiphisternum. It passes antero-laterally and is inserted near the Supracoracoideus superficialis in the groove at the base of the Crista ventralis.

(*b*) *Pars abdominalis.* This is a broad fan-shaped muscle arising from the sheath of the *Rectus abdominis.* The most medial fibres arise most anteriorly near the xiphisternum, whilst the lateral fibres arise from the

level of the [illegible]
converge to a [illegible]
Crista ventralis [illegible]
superficialis.

M. *Coraco-radialis.*—This muscle has a wide origin from the episternum, epicoracoid and the medial ends of the clavicle and procoracoid. The fibres converge to a narrow tendon, which passes under the Supracoracoideus superficialis and runs in a groove in the humerus at the base of the Crista ventralis. Here it lies between the tendons of the Supracoracoideus and Pectoralis sternalis. Further down it is crossed by the Episternohumeralis, and is inserted on the radius near its proximal end

M. *Coraco-brachialis longus.*--Arises from the posterior border of the medial half of the coracoid, and is inserted on the humerus proximally near the groove for Coraco-radialis

M. *Coraco-brachialis brevis.*—Arises from the posterior border of the lateral half of the coracoid, and is inserted on the humerus near Coraco-brachialis longus.

M. *Acromiohumeralis.*—Arises from the acromion and the adjacent portion of the scapula, and is inserted partly on the proximal end of the Crista ventralis and partly on the medial border of the humerus proximally.

M. *Cleidohumeralis.*—A small muscle arising from the lateral end of the clavicle and inserted on the proximal end of the Crista ventralis.

M. *Episternohumeralis.*—Arises from the episternum (=cartilaginous and bony portions) and from the extreme medial end of the clavicle. It possesses a twist, so that the most posterior fibres become anterior and the middle fibres posterior. It passes laterally over the tendons of Supracoracoideus and the Pectorales, and is inserted on the distal end of the humerus near the medial epicondyle.

The following is an account of the musculature in some members of the Ranidæ and Brevicipitidæ in which reduction occurs :—

Rana* (*Ptychadæna*) *mascareniensis **Dum. & Bibr. (Fig. 1.)**

Wide episternal fork. Clavicle slender, extending from acromion to episternum and lying close to coracoid.

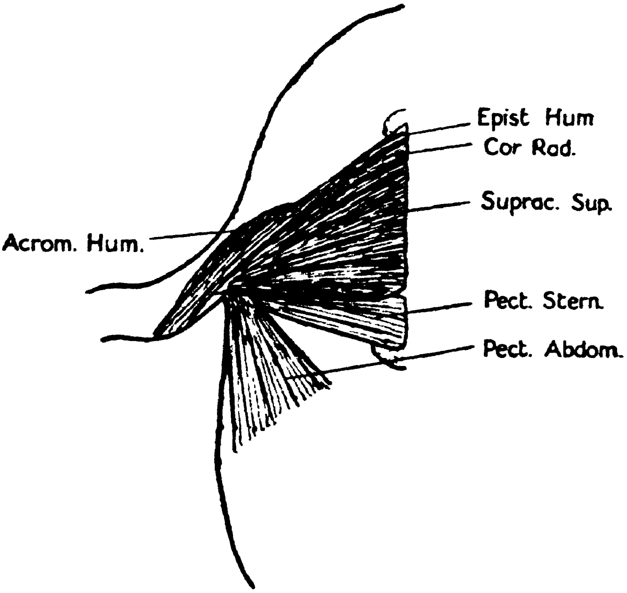
The procoracoid is visible as a narrow plate of cartilage underlying the lateral half of the clavicle.

M. *Episternohumeralis.*—Arises from the whole length of the episternum, has but a slight twist, and is inserted on the Crista ventralis near Supracoracoideus.

M. *Cleidohumeralis* consists of a few fine fasciculi arising from the lateral half of the clavicle. Insertion as in *Rana esculenta.*

The other muscles are as in *Rana esculenta.*

Fig. 1.



Rana (Ptychadœna) mascareniensis.

Abrana floweri (Boulenger) (Parker, 1930).

Clavicle and procoracoid absent, a ligament lying in the position of these structures. Episternum forked and large. Coracoid normal.

M. *Supracoracoideus superficialis* forms a continuous mass with *Episternohumeralis*, and the two are inserted by a common tendon on the Crista ventralis.

M. *Cleidohumeralis* absent.

M. *Coracoradialis* has usual attachments and is entirely hidden by Supracoracoideus.

Other muscles as in *Rana esculenta.*

Arthroleptis pœcilonotus Peters.

Wide episternal fork. Clavicle slender. Procoracoid extending from acromion to mid-line. Coracoid normal.

M. *Supracoracoideus superficialis* broad and entirely hiding Coracoradialis.

M. *Episternohumeralis* is in apposition to Supracoracoideus, and arises from the wide episternal fork and the medial end of the clavicle. Its insertion is near the distal end of the humerus.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta*.

Cacosternum boettgeri Boulenger.

Clavicle and procoracoid absent. Episternum very small.

M. *Episternohumeralis* arises by a pointed tendon from the junction of the epicoracoid and episternum, and the fibres diverge with a slight twist to be inserted halfway down the humerus.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta*.

Sphenophryne cornuta Peters & Doria.

Episternum small. Clavicle thin and slender but reaching the mid-line. Procoracoid a broad plate of cartilage meeting the coracoid medially.

M. *Cleidohumeralis* absent.

M. *Coracoradialis* is entirely hidden by Supracoracoideus and arises from the epicoracoid, episternum, coracoid, and from the whole length of the anterior border of the clavicle.

Other muscles as in *Rana esculenta*.

Oreophryne variabilis Boulenger.

Episternum small and bipartite. Clavicle small and slender and confined to medial half of procoracoid. The procoracoid widens and meets the coracoid near the middle of its length. Coracoid normal.

M. *Cleidohumeralis* absent.

M. *Coracoradialis* not entirely covered by Supracoracoideus and arises from the medial half of the clavicle and procoracoid in addition to its usual attachments.

M. *Pectoralis abdominalis* well developed and meets its fellow in the mid-line.

Other muscles as in *Rana esculenta.*

Genyophryne thomsoni Boulenger.

Episternum Y-shaped. Clavicle absent. Procoracoid present as a slender rod of cartilage.

M. *Episternohumeralis* arises from the episternum and is inserted on the Crista ventralis humeri near Supracoracoideus.

M. *Coracoradialis* arises from the medial half of the procoracoid in addition to its usual attachments.

M. *Cleidohumeralis* absent.

M. *Acromiohumeralis* well developed.

Other muscles as in *Rana esculenta.*

Melanobatrachus indicus Beddome.

Episternum small. Clavicle present as a slender rod of bone lying along the anterior border of the procoracoid but not reaching the episternum. Procoracoid well developed.

M. *Episternohumeralis* present as a distinct bundle, but it is inserted with fibres of the Acromiohumeralis at the proximal end of the Crista ventralis.

M. *Coracoradialis* arises from lateral half of clavicle in addition to its usual attachments.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta.*

Kalophrynus pleurostigma (Blyth).

Episternum small. Clavicle slender. Procoracoid a slender rod of cartilage reaching from acromion to episternum.

M. *Episternohumeralis* well developed and inserted halfway down humerus.

M. *Cleidohumeralis* small and poorly developed.

M. *Coracoradialis* arises from the whole length of the clavicle in addition to its usual attachments.

Other muscles as in *Rana esculenta.*

Chaperina fusca Mocquard.

Episternum bipartite. Clavicle hiding lateral half of the procoracoid, which is well developed medially.

M. *Coracoradialis* arises from procoracoid and the medial half of the clavicle in addition to its usual attachments.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta.*

Cophixalus verrucosus Boulenger.

Episternum reduced to a minute plate of cartilage situated on the epicoracoids. Clavicle and procoracoid absent.

M. *Episternohumeralis* arises from the minute episternum and is inserted on the humerus near the medial epicondyle.

M. *Coracoradialis* arises from the epicoracoid, episternum, and by a few fibres from the anterior border of the medial end of the coracoid.

M. *Pectoralis abdominalis* meets its fellow of the opposite side in the mid-line.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta.*

Kaloula pulchra Gray.

Clavicle absent. Procoracoid reduced to a small cartilage situated on the anterior border of the medial end of the coracoid. Episternum reduced to a small spike of cartilage.

M. *Episternohumeralis* fused with Supracoracoideus at origin from episternum, but separate at insertion on humerus.

M. *Coracoradialis* arises from the vestiges of the procoracoid, the anterior border of the medial end of the coracoid, and from the epicoracoid.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta.*

Microhyla pulchra (Hallow).

No clavicle or procoracoid. Episternum reduced to a small spike of cartilage.

M. *Episternohumeralis* absent.

M. *Cleidohumeralis* absent.

M. *Coracoradialis* arises from the epicoracoid, medial end of the coracoid, and from the episternum.

Other muscles as in *Rana esculenta.*

The pectoral musculature of the following frogs was also examined. These frogs do not exhibit reduction in the breast-shoulder apparatus.

Phrynoglossus martensii Peters.

M. *Episternohumeralis* arises from episternum and medial half of clavicle.

M. *Cleidohumeralis* absent.

M. *Coracoradialis* arises from episternum, epicoracoid, and coracoid. No clavicular attachment.

Other muscles as in *Rana esculenta.*

Philautus [*Ixalus*] *variabilis* (Günther).

M. *Coracoradialis* arises from episternum, epicoracoid, coracoid, and the medial one-fourth of the clavicle.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta.*

Phrynobatrachus natalensis Smith.

M. *Supracoracoideus superficialis* entirely absent.

M. *Coracoradialis* very well developed and hiding Episternohumeralis. It arises from the episternum, epicoracoid, coracoid, and the medial one-fourth of the posterior border of the clavicle.

M. *Cleidohumeralis* very well developed.

Other muscles as in *Rana esculenta.*

Cardioglossus gracilis Boulenger.

M. *Coracoradialis* well developed, arising from episternum, epicoracoid, and the medial four-fifths of the coracoid. No clavicular fibres.

Other muscles as in *Rana esculenta.*

Astylosternus [*Trichobatrachus*] *robustus* (Boulenger).

All muscles as in *Rana esculenta.*

Breviceps mossambicus Peters.

Mm. *Episternohumeralis* et *Supracoracoideus superficialis* separate at their origins, but fused at insertion on humerus *.

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* The Episternohumeralis is regarded by Anthony and Vallois (1914) as a detached portion of the Supracoracoideus superficialis. In support of this the following data can now be adduced :—In *Hypopachus mülleri* and *Abrana floweri* one large muscle, taken to represent

M. *Cleidohumeralis* absent.

M. *Coracoradialis* arises from episternum, epicoracoid, coracoid, and the medial half of the clavicle.

Other muscles as in *Rana esculenta*.

Hypopachus mülleri (Boettg.).

Mm. *Episternohumeralis* et *Supracoracoideus* indistinguishably fused.

M. *Coracoradialis* arises from episternum, epicoracoid, coracoid, and the medial two-thirds of the clavicle.

M. *Cleidohumeralis* absent.

Other muscles as in *Rana esculenta*.

Mantipus inguinalis (Boulenger).

M. *Coracoradialis* arises from the medial three-fifths of the clavicle and from the procoracoid in its medial half, in addition to its usual attachments.

Other muscles as in *Rana esculenta*.

Dyscophus guineti (Grandidier).

M. *Coracoradialis* arises from the medial two-thirds of the clavicle in addition to its usual attachments.

Other muscles as in *Rana esculenta*.

From the above account it is seen that the muscles which are most variable in their attachments are the Episternohumeralis, Cleidohumeralis, and Coracoradialis. The Supracoracoideus superficialis varies in the extent to which it covers the Coracoradialis. The other muscles of the pectoral complex are normally developed.

The *Episternohumeralis* shows variations in the following ways:—

In *Cacosternum*, in which the clavicle and procoracoid are absent and the episternum is small, and in *Kalophrynus*, in which the clavicle is reduced and the episternum small, the muscle is inserted halfway down the humerus, not near the distal end as in *Rana esculenta*.

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a fusion of both muscles, occupies the position usually filled by the two muscles. This muscle has the compound origin of the two usually present. In *Sphenophryne cornuta* and *Kaloula pulchra* they are continuous at their origin but separate at their insertions on the humerus. In *Breviceps mossambicus* they are separate at their origins but fused at their insertion. In *Phrynobatrachus natalensis* the Episternohumeralis alone is present.

In *Ptychadæna* (clavicle reduced, episternum large), *Melanobatrachus* (clavicle reduced, episternum small), and in *Genyophryne* (clavicle absent, episternum reduced) the muscle is inserted near the Pectorales on the humerus. In *Arthroleptis* (episternum well developed) and in *Sphenophryne*, *Cophixalus*, and *Oreophryne* (in all of which the episternum is very reduced) the muscle arises from the episternum and is inserted near the distal end of the humerus. In *Abrana* it is fused with the Supracoracoideus. In *Kaloula* it is fused with the Supracoracoideus at its origin from the episternum, but gains a distinct insertion halfway down the humerus. Thus it is seen that, although the episternum from which the muscle arises may be very reduced, the muscle is still present. It may exhibit variations in its distal attachments to the humerus, but these seem to bear no relation to the skeletal condition, being marked in some forms in which there is no reduction and not being apparent in other forms in which the episternum is almost wanting.

The *Cleidohumeralis*, a small muscle even in *Rana esculenta*, is often absent entirely, as in *Arthroleptis*, *Cacosternum*, *Abrana*, *Sphenophryne*, *Oreophryne*. *Genyophryne*, *Melanobatrachus*, *Chaperina*, *Cophixalus*, *Kaloula*, and *Microhyla*. It is present as a few small fasciculi in *Ptychadæna* and *Kalophrynus*. The variability of this muscle is thus not apparently connected with any skeletal changes.

The *Coracoradialis* is conveniently dealt with in five groups, the clavicular region attachments only being considered, since the episternal, epicoracoidal, and coracoidal attachments are constant.

A. Clavicle well developed or only slightly reduced, muscle arising from its whole length or from greater part of its length :—*Sphenophryne*, *Kalophrynus*, *Chaperina*, *Melanobatrachus*, *Breviceps*, *Hypopachus*, *Dyscophus*, *Mantipus*.

B. Clavicle well developed or only slightly reduced, muscle having no attachment to it or only to extreme medial end :—*Ptychadæna*, *Arthroleptis*, *Phrynoglossus*, *Philautus*, *Phrynobatrachus*, *Cardioglossus*, *Astylosternus*.

C. Clavicle well developed. muscle arising from medial half or third only :—*Hyloxalus*, *Phyllobates*, *Dendrobates*, *Rhinoderma*, *Oreophrynella*, *Atelopus*, *Brachycephalus*.

D. Clavicle reduced, procoracoid present, muscle arises from procoracoid in greater part of its length :—*Oreophryne*, *Genyophryne*, *Kaloula*.

E. Clavicle and procoracoid entirely absent :—*Cacosternum*, *Abrana*, *Cophixalus*, *Microhyla*.

It is seen that Groups A and D comprise Brevicipitids only, and that in these frogs, although the clavicle and procoracoid may be quite reduced, the muscle still retains its attachment to their vestiges. Groups B and C, on the other hand, contain Ranids and Rhacophorids only, and the Coracoradialis, having at most only a few fibres attached to the medial end of the clavicle, is little affected by its reduction.

The muscles that are affected to any extent then by the skeletal reduction are the Episternohumeralis and Coracoradialis. The other muscles of the pectoral complex have approximately the same attachments in all the frogs studied.

The Episternohumeralis has been shown to vary in its insertion on the humerus and also to the extent in which it is blended with or distinct from the Supracoracoideus, but these variations bear no relation to any skeletal changes. Similarly, the Coracoradialis has been shown to be variable in its clavicular attachments, but here again the variations seem to be in no way related to the skeletal reduction which has occurred.

Thus in the Firmisternia the anterior ventral elements of the breast-shoulder apparatus may be quite reduced and vestigial without any corresponding reduction of the muscles normally arising therefrom, and thus it appears that the skeletal reduction is not caused by reduction of the musculature.

B. THE PECTORAL MUSCULATURE AS A GUIDE IN CLASSIFICATION.

Attempts have been made (Noble, 1922, 1924) to employ the musculature in Amphibia Salientia in the diagnosis of families and family relationships. The thigh musculature has been used with some success, so the constancy of certain muscles in the pectoral complex was tested to ascertain whether they had any taxonomic value.

The muscles which have been examined in this connection are the *Episternohumeralis longus* and the *Supracoracoideus profundus*. The relations of the Episternohumeralis longus are dealt with in the first part of this paper. The Supracoracoideus profundus lies typically at the posterior border of the Supracoracoideus superficialis and between it and Pectoralis sternalis. It is sometimes overlapped by one or other of these muscles. It arises from the medial end of the coracoid and from the adjoining epicoracoid, and is inserted on the humerus near Supracoracoideus superficialis (figs. 2 & 3).

The table on p. 417 gives the condition of the muscles in the species examined.

It is seen that Supracoracoideus profundus is present in the two species of Bufonidæ examined and that Episternohumeralis longus is absent in both.

In the Leptodactylidæ Supracoracoideus profundus is present in eleven out of twelve species, being absent in *Borborocœtes* only. Episternohumeralis is present in eleven out of twelve species (absent in *Rhinophrynus*).

In the Pelobatidæ Supracoracoideus profundus is present in three species and absent in three species. Episternohumeralis is present in all six species.

In the Rhacophoridæ Supracoracoideus profundus is absent and Episternohumeralis present.

The Brachycephalidæ have Supracoracoideus profundus present in five out of six species and Episternohumeralis present in all six. In the Hylidæ Supracoracoideus profundus and Episternohumeralis are present in all five species. Specimens of *Hyla arborea* from twelve localities ranging from Belgium to Japan were examined, and the musculature was identical in all.

In the Pipidæ Supracoracoideus profundus is absent and Episternohumeralis is present in *Xenopus*.

In the Discoglossidæ both muscles were present in the two species examined.

Thus in 28 out of 35 species Supracoracoideus profundus is present, but is not distinct in 7 out of 35 species. It is worthy of note that it is present in *Megophrys major* and *M. hasseltii*, but is absent in *Megophrys montana*, where it is apparently represented by a thickening of the posterior border of Supracoracoideus superficialis. Episternohumeralis longus is present in 33 out of 35 species, being absent only in the two Bufonids examined. It often appears to be absent but is in reality overlapped to

Fig. 2.

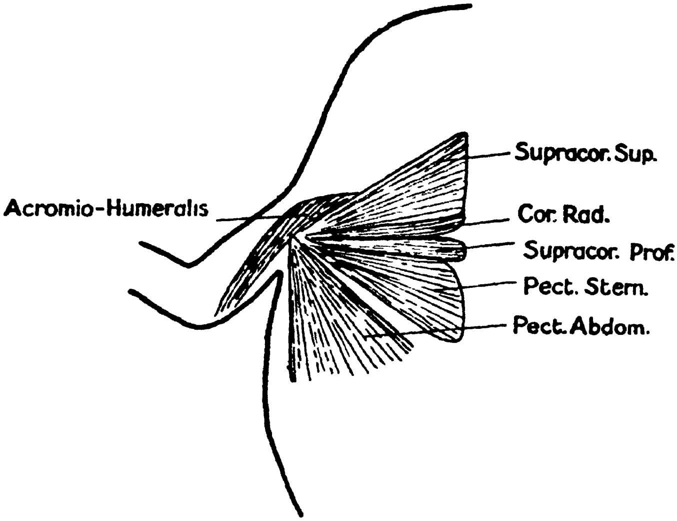


Fig. 3.

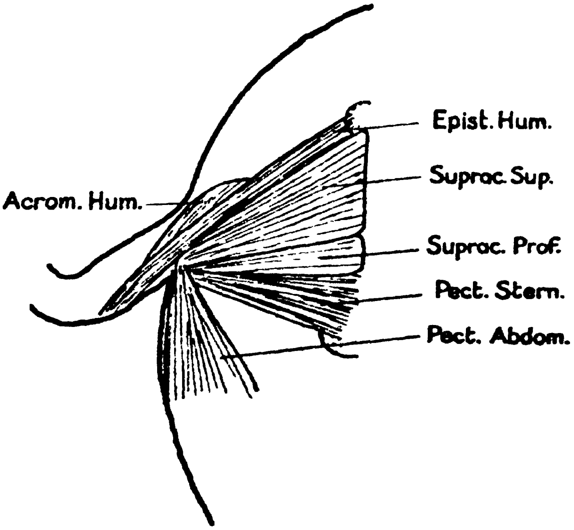


Fig. 2.—***Bufo viridis.***
Fig. 3.—***Hyla arborea.***

varying degrees at its origin by Supracoracoideus superficialis, and can be found on reflecting this muscle.

	Episternohumeralis distinct from Supracoracoideus superficialis.	**Supracoracoideus profundus present.**
BUFONIDÆ.		
Bufo regularis Reuss	No.	Yes.
Bufo viridis Laur. (fig. 2)	No.	Yes.
LEPTODACTYLIDÆ.		
Leptodactylus ocellatus Girard	Yes.	Yes.
L. caliginosus Girard	Yes.	Yes.
Rhinophrynus dorsalis Dum. & Bibr.	No.	Yes.
Crossodactylus gaudichaudii Dum. & Bibr.	Yes.	Yes.
Borborocœtes grayi Bell	Yes.	No.
Hylodes conspicillatus (Cope)	Yes.	Yes.
H. fleischmanni Bttgr.	Yes.	Yes.
Pleurodema bibroni Tschudi	Yes.	Yes.
Chiroleptes australis (Gray)	Yes.	Yes.
Limnodynastes tasmaniensis (Günther)	Yes.	Yes.
L. peronii Dum. & Bibr.	Yes.	Yes.
Uperoleia marmorata Gray	Yes.	Yes.
PELOBATIDÆ.		
Pelobates fuscus Rosel	Yes.	No.
P. cultripes (Cuvier)	Yes.	No.
Pelodytes punctatus Daud. Rain.	Yes.	Yes.
Megophrys hasseltii (Tschudi)	Yes.	Yes.
M. montana (Kuhl)	Yes.	No.
M. major (Blgr.)	Yes.	Yes.
RHACOPHORIDÆ.		
Rhacophorus leucomystax Grash.	Yes.	No.
BRACHYCEPHALIDÆ.		
Brachycephalus ephippium Spix	Yes.	Yes.
Hylixalus bocagii Espada	Yes.	Yes.
Phyllobates trilineatus Hammard	Yes.	Yes.
Dendrobates tinctorius Dum. & Bibr.	Yes.	Yes.
Rhinoderma darwini Dum. & Bibr.	Yes.	No.
Oreophrynella macconnelli Blgr.	Yes.	Yes.
HYLIDÆ.		
Hyla arborea L. (fig. 3)	Yes.	Yes.
H. rubra Daud. Rain	Yes.	Yes.
Phyllomedusa sauvagii Blgr.	Yes.	Yes.
Agalychnis moriletii A. Dum.	Yes.	Yes.
Pseudis paradoxa Merian	Yes.	Yes.
PIPIDÆ.		
Xenopus lævis Wagl.	Yes.	No.
DISCOGLOSSIDÆ.		
Discoglossus pictus Cetti	Yes.	Yes.
Bombinator pachypus Blgr.	Yes.	Yes.

All the species considered above belong to the Arcifera. Twenty-six species of Firmisternal frogs, most of which are described in the first part of this paper, were examined for Supracoracoideus profundus, but it was not found in any specimen. This muscle thus seems to be characteristic of the Arcifera as opposed to the Firmisternia, but it cannot be said to be characteristic of any particular family.

In the Firmisternia Episternohumeralis is very variable (see Part A of this paper, p. 412). In the Arcifera it is found absent in the Bufonidæ and one member of the Leptodactylidæ only. In all the other Arciferal species examined it is present.

In the Brevicipitids Coracoradialis arises from the lateral half or whole length of the clavicle or procoracoid, while in the Ranids and Rhacophorids it arises from the medial half or third only (see part A of this paper, p. 413).

Thus as a character of the order the pectoral musculature may be of value, but as a family character it can only be of very minor importance, and cannot be relied on in classifying any particular species.

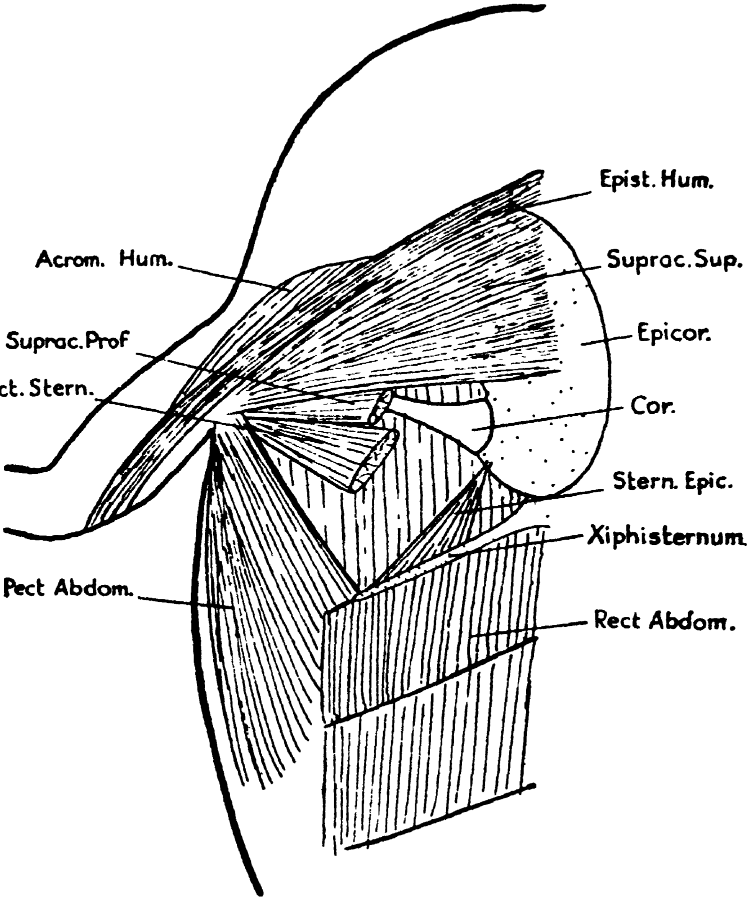
C. ON THE STERNO-EPICORACOIDEUS, A MUSCLE NEW TO AMPHIBIAN LITERATURE.

In some species of Arcifera a small muscle hitherto undescribed is to be found passing from the xiphisternum to the epicoracoid. L. v. Méhely (1904) figures what is apparently the tendon of insertion of this muscle on the epicoracoid in *Paludicola* and *Eupemphix*. No reference, however, is made to it in the text, and no description of it can be found in the literature.

It is well developed in *Bombinator pachypus*, and its relations in this species are as follows (fig. 4):— The xiphisternum is widely forked and to its posterior border is attached Rectus abdominis. From the ventral surface Pectoralis sternalis arises. When this muscle is reflected a muscle can be seen to arise from the lateral half of the anterior border of the xiphisternal fork and converge fanwise to a narrow tendon, which is inserted on the under (dorsal) surface of the corresponding epicoracoid near its posterior margin. This is the muscle under consideration, and having regard to its attachments it is proposed to call it the *Sterno-epicoracoideus*. The nerve-supply is from the third spinal nerve. Deep to this muscle the Sterno-hyoid can be seen passing up in its normal relations.

Morphologically it is probably to be regarded as a detached and specialized portion of the Rectus abdominis.

Fig. 4.



Bombinator pachypus.

The evidence for this is: in *Rhinophrynus dorsalis* the Rectus abdominis has a broad band of muscle inserted on the posterior border of the epicoracoid. In *Hyla arborea* and *H. rubra* a band of muscle passes from the first myocomma of the Rectus and converges to a narrow tendon inserted on the dorsal surface of the epicoracoid. In *Pleurodema bibroni*, *Limnodynastes tasmaniensis*, and *L. peronii* a muscle obviously the homologue of the Sterno-epicoracoideus in *Bombinator* arises from the myocomma and from the adjoining sternum, and is inserted by a narrow tendon into the dorsal surface of the epicoracoid. The condition found in *Bombinator* is also found in *Discoglossus pictus* and in *Chiroleptes australis*.

The muscle is not constantly present in the Arcifera, being found only in the above-mentioned species out of thirty-five examined.

I am indebted to the authorities of the British Museum (Natural History) for the facilities afforded me to do this work, and to Mr. H. W. Parker for constant help and advice.

As a complete list of references is impossible, a selection of the more important works is given as a bibliography.

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XL.—*Notes on Coprid Coleoptera, with Descriptions of a new Genus and a few new Species.* By GILBERT J. ARROW.

IN my lately published volume of the 'Fauna of British India' (Lamellicornia, part 3), devoted to the Coprinæ, I treated *Copris vitalisi* Gillet as a synonym of *C. doriæ* Har. M. Boucomont has kindly pointed out to me certain features by which the two forms may be distinguished, and I desire to amend my key on p. 103 as follows:—

Pronotum with a slight posterior median groove; mesosternum rugose; ♂ with a short, slender cephalic horn ...	*doriæ* Har.
Pronotum without median groove; mesosternum closely punctured; ♂ with a blunt cephalic tubercle	*vitalisi* Gill.

C. doriæ occurs in Borneo, Sumatra, the Malay Peninsula, and Tenasserim.

C. vitalisi inhabits Indo-China and Assam.

Another error to be noted in the Indian work occurs in plate vii., where figures 8 and 9 representing *Synapsis brahminus* and *S. tridens* have unfortunately been transposed.

In the same volume I have inadvertently used for two newly described species of the genus *Onthophagus* names used by Dr. Gillet in 1927 for species of the same genus, and I therefore propose to substitute other names. The species in question are:—

Onthophagus acuticollis Arrow, Fauna of India, Coleopt. Lamell. part 3, 1931, p. 237, fig. 25, which I desire to rename *O. amphioxus*.

Onthophagus solidus Arrow, *op. cit.* p. 265, for which I propose to substitute *O. compactus*.

Dr. Gillet has also called my attention to the fact that the species described and figured by me on p. 178, pl. xiii. figs. 9, 10, 11, as *Onthophagus anguliceps* Bouc. (and identified for me by M. Boucomont as that species) is not the true *anguliceps*, of which he has kindly sent me co types. This name I find should replace *O. aviculus* Arr. p. 179, pl. xiii. figs. 13, 14, and for the false *anguliceps* I propose the new name *O. avocetta*.

Since the publication of my volume a (so-called) new Indian species of *Onthophagus* has been described and figured by Dr. Balthasar (Stett. Ent. Zeit. 1932, p. 151) under the name *Onthophagus zubaci*, from a single specimen in his possession. This is evidently a female example of *O. dama* F., one of the most abundant and best known of all the Indian forms of this enormous genus. It is compared by Dr. Balthasar to two species to which it has no resemblance, and which are evidently unknown to him. It is a pity that literature should be burdened with unnecessary descriptions, made in the absence of adequate materials for comparison and without the long preliminary study required by a genus of such exceptional difficulty as *Onthophagus*.

DERONITIS, gen. nov.

Corpus elongato-ovatum, pedibus sat robustis, anticorum tibia acute quadridentata, tarso minuto, intermediorum et posticorum tibiis extus serratis, apicibus latis, metatarsis latis et longis, quam articulis 4 sequentibus conjunctim longioribus, coxis intermediis parallelis et distantibus. Caput haud latum, oculis supra et subtus minutis, genis retrorsum sat anguste lobatim productis. Antennæ 9-articulatæ. Mentum latum, lobis membranaceis angustis, late divergentibus, palpis biarticulatis. Prothoracis margo anticus utrinque pone lobos oculares excisus, margo posticus arcuatus, anguli antici obtusi, postici nulli. Scutellum parvum. Elytra deplanata, costa epipleurali acuta.

Prosternum postice haud tumidum aut productum.

Deronitis ephippiatus, sp. n. (Fig. 1.)

Niger, supra opacus, setis minutissimis partim vestitus, elytrorum basi transversim flavo-maculato, apice setis paulo majoribus vestito ; elongato-ovalis, clypeo antice fere recto ; pronoto dense punctato-rugoso, lateribus antice leviter sinuatis, postice rotundatis ; elytris leviter striatis, haud perspicue punctatis, lateribus antice rectis, parallelis, postice late rotundatis ; pygidio minute setoso ; metasterno medio nitido, lateribus punctato-rugosis et setosis ; abdominis medio nitido, lateribus opacis :

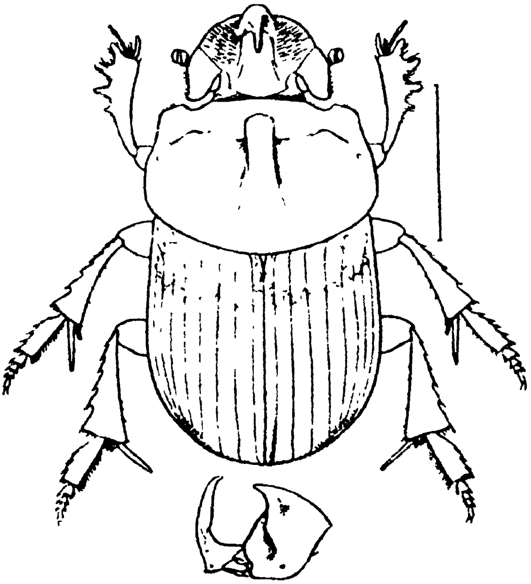
♂, capite antice cornu longo, erecto, postice acuminato, retrorsum arcuato armato ; pronoto medio tumido, antice fortiter antrorsum producto, processus apice haud acuminato, truncato, fere dilatato, pronoti parte antica retusa, lateribus utrinque tuberculo obtuso armatis.

Long. 20 mm. ; lat. max. 10 mm.

UGANDA : Katunguru, Kasinga Channel (*Dr. E. B. Worthington*).

Only one example of this singular insect is known to me. It is a well-developed male, but until the other sex is discovered it must remain a little uncertain which of its peculiar features are confined to the male sex. It is a member of the rather heterogeneous group of species united under the name *Oniticellus* in the catalogues, but which has already been partly dismembered. Although very different in its shape and general appearance it seems to have some kind of affinity with the little-known genus *Tragiscus*. The single species of that genus, *T. dimidiatus* Kl., is unknown to me, but has the hind tarsi of the same peculiar form as the middle and hind tarsi of *Deronitis ephippiatus*, and has also the same unusual coloration, the elytra being yellow in the anterior part.

Fig. 1.



Deronitis ephippiatus, sp. n.

The legs are very stout, the tibiæ, especially those of the hind pair, very broad at the end, and the middle and hind tarsi are very short but with the basal joint long, broad, and flat, its length much greater than that of the four following joints combined. The head is of very peculiar shape, the eyes greatly reduced, the part visible beneath not much larger than the very inconspicuous dorsal part, and the lateral lobes of the head are produced backward as strong, narrow, and bluntly rounded processes. To receive these processes the prothorax has an excavation of the front edge on each side. The front angles of the thorax are very blunt, the sides are only feebly angulate before the middle and from there form a continuous curve with the base. The elytra are very flat, with the epipleuræ narrow but abruptly vertical and marked off by a very sharp lateral carina.

The armature of the male is highly developed and of a similar type to that found in *Liatongus vertagus* F. and allied species. The head bears a long, curved, sharply pointed horn directed upward and backward, and the prothorax a shorter one directed forward, a little compressed, and truncate at the end.

The peculiar features of the insect seem to indicate digging powers even greater than those of its allies, and it is possible that subterranean habits may account for its apparent rarity and the absence of the undiscovered female. The posterior processes of the head and the adaptation of the thorax to receive them evidently serve to produce rigidity and so increase the fossorial power, and are analogous with the similar structure independently acquired in some species of the genus *Synapsis* and the Lucanid genus *Nigidius*. The stout legs, broad tibiæ, and short flattened posterior tarsi have the same significance. These features are no doubt found in both sexes, since the labours of the female involve more digging than falls to the male, usually the collector of provisions. In certain species of the related genus *Onthophagus* (*O. rubricollis* etc.) a similar modification of the middle and hind tarsi is found in the female alone.

Pseudopedaria gilleti, sp. n.

Niger, nitidus, late ovatus, convexus, capite medio obtuse tuberculato, antice leviter ruguloso, postice subtiliter punctato, margine antico angulatim exciso, bidentato: pronoti lateribus dense punctatis, medio fere polito, vix gibboso; elytris leviter striatis, striis minute sed numerose punctatis, intervallis lævibus, fere planis; pygidio fortiter et crebre punctato, metasterni parte antica rugosa, lateribus fortiter et crebre, medio subtiliter punctatis; pedibus sat

robustis, tibia antica lata, acute quadridentata, dente apicali obliquo, quarto minuto.

Long. 10–11 mm.; lat. max. 6–6·5 mm.

N.W. RHODESIA: Kashitu, N. of Broken Hill (*H. C. Dollman*, Jan., Feb., April, Dec.).

TANGANYIKA TERRITORY.

The British Museum Collection contains a good series of this. The examples from Tanganyika Territory were presented by Dr. J. J. Gillet. I have found no external difference between the sexes. Only a single species of *Pseudopedaria*, *P. grossa* Thoms., inhabiting the Gaboon and Cameroon region, has been catalogued. The present is a considerably smaller insect, and its upper surface is shining black instead of being closely punctured, dull, and dark brown. The head is rather coarsely and not very closely rugose, with an obtuse median elevation and bidentate clypeus. The pronotum is closely punctured at the sides and in front and slightly humped in front of the middle, where it is very smooth and shining. The elytra are finely striate, with close, minute punctures in the striæ and very smooth intervals. The pygidium is strongly and rather closely punctured and the lower surface is also punctured, except the middle of the metasternum. The legs are short and stout and the front tibiæ bear four sharp teeth, the terminal one strongly oblique and the fourth very short and minute.

Copris gladiator, sp. n. (Fig. 2.)

Niger, nitidus, convexus, modice elongatus, capite fere lævi, punctis nonnullis sparso, antice haud acute angulatim exciso; pronoto antice lævi, postice et lateraliter fortiter punctato, angulis anticis obtusis; elytris sat fortiter striatis, striis minutissime sed haud laxe punctatis; pygidio modice fortiter et crebre punctato; metasterno medio lævi, antice et lateraliter modice punctato:

♂, capitis cornu longo, gracili, basi vix dentato, pronoti dorso medio processu bifido haud lato, medio fortiter canaliculato cornubusque duobus lateralibus curvatis gracilibus munitis.

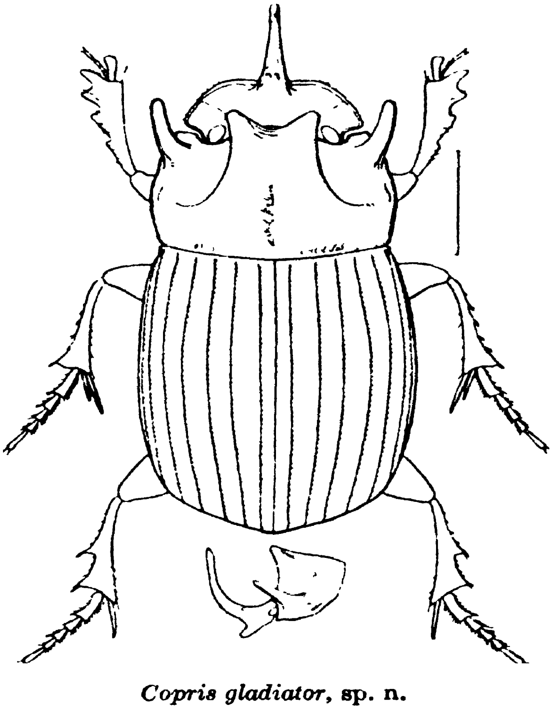
Long. (cornubus exceptis) 13 mm.; lat. max. 7·5 mm.

N. BURMA: Adung Valley, 6000 ft. (*Lord Cranbrook*, May).

A single male.

Although agreeing, in my table of the Indian species, with *C. delicatus*, and of similar size, this is at once distinguished by the very slender, curving, lateral thoracic horns and narrower dorsal process of the male. It is extremely closely related to the Japanese and Chinese *C. acutidens* Mots., from which it differs in the male (the female is not known) by the very long and slender lateral thoracic horns, which are not broad at the base and tapered, as in that species, nor straight, but distinctly curved. The dorsal process is a little less narrow in front, the two terminal lobes curving slightly outwards. There is another inconspicuous difference in the emargination of the clypeus, which is angular, instead of forming a gentle curve as in *C. acutidens*. The cephalic horn is very long, as in well-developed examples of the allied species, and the very slender lateral thoracic horns are longer than in similar-sized specimens of it and more divergent, the distance between the tips not narrower than the thorax at its widest part. The cephalic horn has only minute vestiges of basal teeth.

Fig. 2.



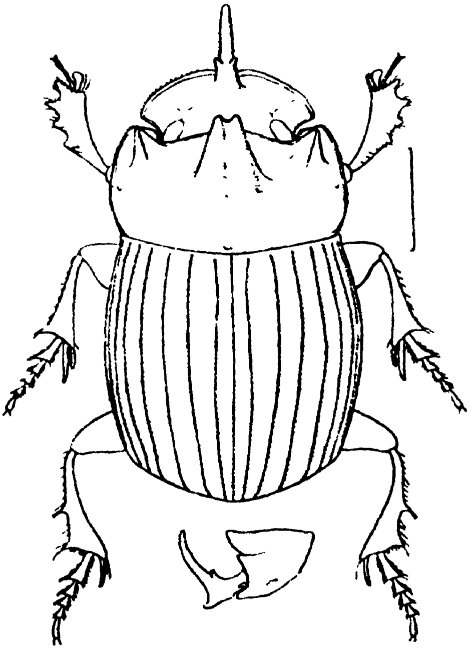
Copris gladiator, sp. n.

Copris angusticornis, sp. n. (Fig. 3.)

Niger, nitidus, convexus, modice elongatus, capite lævi, punctis nonnullis lateralibus sparso, antice vix emarginato; pronoto punctis fortibus inæqualiter, lateraliter crebrius, sparso, angulis anticis haud acutis; elytris sat fortiter striatis, striis minutissime sed haud laxe punctatis; pygidio modice fortiter et crebre punctato; metasterno medio lævi, antice et lateraliter sat parce punctato:

♂, capitis cornu longo gracili, basi bene bidentato, pronoti dorso medio processu antrorsum attenuato, apice minute bifido, supra fortiter canalicuato cornubusque lateralibus duobus acuminatis conicis.

Fig. 3.



Copris angusticornis, sp. n.

Long. 13 mm.; lat. max. 7·5 mm.

Tonkin: Chapa (*Jeanvoine*, April).

A single male.

This is closely related to the previous species and still more closely to *C. acutidens*. It differs from both in the very narrow dorsal process of the male thorax, which tapers from base to apex, where it is only minutely bifid. The cephalic horn is very long and slender, as in the allied

species, and the minute basal processes are rather more developed than in any example I have seen of *C. acutidens*. The emargination of the clypeus is extremely feeble. The lateral thoracic horns are, as in that species, broad at the base and tapering to a point at the apex. The pygidium is rather coarsely and closely punctured and the puncturation of the upper and lower surfaces does not appreciably differ from that of *C. acutidens.*

Synapsis yunnanus, sp. n.

Niger, parum nitidus, ovatus, modice convexus, capite antice rugoso, postice granulato, clypeo medio anguste et profunde inciso, obtuse bidentato, fronte fortiter et acute tuberculato, lobis lateralibus longissime acute productis ; pronoto antice medio paulo producto, postice tumido, lævi, fortiter longitudinaliter sulcato, partibus reliquis crebre granulatis, marginibus lateralibus antice tridentatis ; elytris leviter striatis, intervallis vix planis, parum nitidis ; pygidio haud crebre granulato, sat nitido : metasterno nitido, postice transversim excavato ; pedum posticorum femoribus dentatis, tibiis fortiter arcuatis, apice latissimis :

♂, pedum intermediorum femore dentato, posticorum femore bidentato, tibia supra dense rufo-penicillata.

Long. 29–40 mm. ; lat. max. 18–24 mm.

S.W. CHINA, YUNNAN : Tali, Teng-yueh (*J. C. Brown*), Chien-chuan-chou, 7700 ft. (*J. W. Gregory*, June).

The head is rugose in front and granular behind, short and very broad, with the clypeus deeply notched in the middle and bluntly bilobed, and the ocular lobes produced into long, curved, and sharply pointed processes. There is a rather strong and sharp tubercle in the middle of the forehead. The pronotum is rather tumid in its posterior half which is smooth and shining in the middle and has a longitudinal median groove, and there is a blunt prominence a little behind the middle of the front margin. The anterior half, the sides, and a narrow basal band are closely granular. The lateral margin is rounded, the front angle sharply toothed, with two other teeth adjoining it, the hind angle entirely obsolete, and the base rounded. The elytra are very lightly striate, the intervals nearly flat and rather opaque. The pygidium is rather shining, and bears fine, not very close granules except at the apex. The metasternum is very smooth in the middle, very lightly rugulose at the sides, and rather deeply excavated behind. The middle and hind tibiæ are broad at the end, the latter is very strongly bent in its hinder part, and the hind femur has a sharp posterior tooth not far from the base.

In the male the hind femur has an additional tooth on its outer face near the middle of its length, the middle femur has a slight tooth near the middle of its hinder edge, and the hind tibia has a long and close fringe of hairs upon the posterior part.

This species is closely similar to *S. tridens* Sharp, found in Assam, but appears to be on the average a little larger and more elongate. There is a more pronounced broad prominence behind the front margin of the pronotum, and the hind tibiæ are more produced at the extremity and more strongly bent. The male is distinguished by the presence of a tooth upon the middle femur and two strong teeth upon the hind femur.

Gyronotus elongatus, sp. n. (Fig. 4.)

Fusco-cupreus, clava antennali flava, opacus, capite corporisque subtus medio vix nitidis, elongatus, convexus; capite dense punctato, punctis postice fortiter, antice leviter impressis, clypeo acute bidentato; pronoto toto densissime punctato, lateribus medio fortiter angulatis, deinde antice et postice recte convergentibus, angulis anticis acutis, posticis obtusis; elytris subtiliter striatis, intervallis planis, minute haud dense punctatis, apicibus paulo productis, abdomen toto obtegentibus; mesosterno et metasterno minute æqualiter punctatis, linea bene arcuata divisis:

♂, tibia antica elongata, attenuata, apice incurvo, obtuso, metasterno medio excavato, pygidio convexo, oblique recurvo:

♀, tibia antica minus tenui, apice subtruncata, angulo interno acuto, pygidio horizontali, concavo.

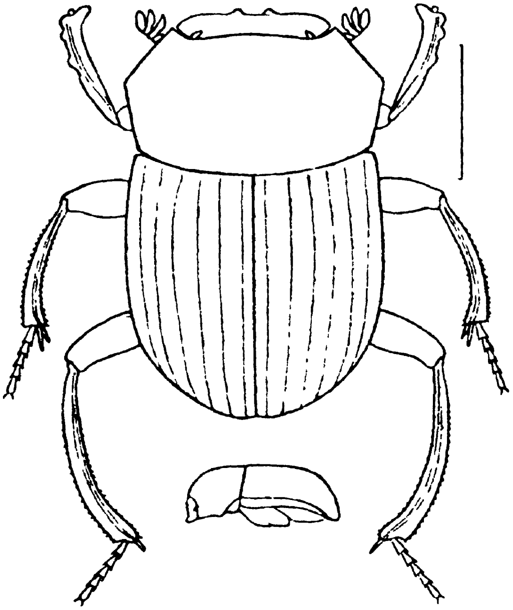
Long. 15–17 mm.; lat. max. 10–11 mm.

NATAL: North Zululand.

Although agreeing in its generic characters this species differs conspicuously from those previously described. It is much more elongate and distinctly coppery beneath and upon the head and thorax. The whole surface is finely punctured and, except for a very slight lustre upon the head and the middle of the metasternum, very dull and opaque. The sides of the prothorax are not curvilinear but strongly angulate before the middle, and straight from there to the front and hind angles.

The legs are stout and long and the tibiæ curved, the teeth of the outer edge of the front tibia very blunt and feeble in both sexes. The two sexes differ markedly. The front tibia of the male is very slender and bluntly hooked at the end and the metasternum has a deep oval cavity. The most exceptional feature of the species is the completely hollowed and horizontally inclined pygidium of the female.

Fig. 4.



Gyronotus elongatus, sp. n.

XLI.—*Ten new Mammals from the Dutch East Indies.*

By H. J. V. Sody.

Rattus bartelsi tjibuniensis, subsp. n. (Java.)

Type (♂ ad.).—Tjiboeni, Bandoeng, W. Java, 1350 m., coll. Sody, no. Tjib. 52.

Specimens examined.—22, all from the type-locality.

I have to thank Dr. M. Bartels, Jr., for the opportunity of describing this new race. All the specimens were presented to me by Mr. Bartels, who trapped them himself, and was the first to observe the shortness of the tail, which is the main distinguishing character of this new form.

Diagnosis.—A short-tailed form of the species described by Jentink from Goenoeng Gede (W. Java). In Zool. Med. Rijks Mus. Nat. Hist. Leiden, xiii. 1930, p. 132, I have given the relative tail-length for the species, based exclusively on specimens from Goenoeng Gede. In 51 specimens from there the tail appeared to be 95–121, averaging 108 per cent. of the length of head and body. In the 22 Tjiboeni specimens the tail is only 90–112, averaging 100 per cent. of the length of head and body. In 51 specimens from G. Gede there are only 3 which have tails shorter than head and body (95–99–99 per cent.), in 22 Tjiboeni specimens there are 11. Besides the tooth-row seems to average a little longer in *tjibuniensis*: 51 specimens of *bartelsi typicus* give 5·0–5·7, aver. 5·35 mm., and 15 specimens of *tjibuniensis* give 5·2–6·0, aver. 5·56 mm.

Mammæ Formula $1+2=6$ *.

Young.—The coat of the young of this rat appears to differ very strongly from that of the adults in being much darker, and especially in lacking the bright orange or brown tips of the hairs on the dorsal side.

Measurements of Type.—Head and body 159; tail 147; hind foot 33; ear 22. Skull: greatest length 39·0; occipito-nasal length 38·9: condylo-basal length 32·8; palatal length 17·9; zygomatic breadth 17·1; breadth of brain-case 15·2; interorbital constriction 6·6; length of nasal 14·5; breadth of combined nasals 3·9; diastema 11·1; palatal foramina 5·9; length of upper tooth-row 5·3 mm.

With the exception of the differences in the relative length of the tail and in the length of the tooth-row and of the whole skull, the new race seems to be like the typical form.

Rattus schuitemakeri, sp. n. (Borneo.)

Type (♀ ad.)—Pontianak, W. Borneo, July 1932 (coll. Sody).

Specimens examined.—One, the type. The specimen was presented to me by Mr. J. P. Schuitemaker, who collected it and in whose honour the name is given.

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* Twice (*l. c. a.* and Natuurk. Tijdschr. Ned. Ind. xci. 1931, p. 214) I made the fault of giving this same formula for another Javanese rat, viz., *Rattus lepturus*. In reality, the mammæ formula of *R. lepturus* is $2+2=8$.

Diagnosis.—This is a very remarkable rat, and it is a pity that only one specimen was obtained. It differs in many characters from *Rattus concolor* (the only species to which it shows close relationship), but I cannot put aside the thought that it might be a very abnormal specimen of that species. However, considering that the observed several (and rather large) differences from *concolor* form a fact, whilst the thought that all of these differences might be merely abnormalities, is a supposition only, I think I cannot but form a new species for it. However, feeling myself unsafe, I sent the skull of my rat to Mr. F. N. Chasen, of the Raffles Museum at Singapore, asking him for his opinion. Mr. Chasen was so kind as to write to me, and his conclusions agree very well with mine. He writes :—" I have compared the skull with all the small rats known to me and it is nearest to *concolor*. But I admit that I cannot match it with any of my very long series of specimens from many parts of the range of this species. . . . What a pity you have only one specimen—it may be abnormal." The main deviations of the skull, as compared with that of *R. concolor*, are :—

(1) The pale colour of the anterior surface of the incisors.

(2) The more expanded zygomata.

These two differences are very clear (and were also valued as such by Mr. Chasen) and certainly they are not unimportant. Besides these, there are some minor differences, which may not have much significance. Such are :—the broader (more forward projecting) zygomatic plate and the, anteriorly, slightly more acutely pointed nasals. The extraordinary length, moreover, shown by the upper incisors, is certainly an abnormality in this specimen.

Besides these (two) skull-differences, which thus were controlled by Mr. Chasen, there are some differences in the external measurements and in the colour of the fur ; originally, it was these latter differences which induced me to examine the skull so exactly. Though also in the skin a certain resemblance to *R. concolor* cannot be denied, I think the differences here are even larger than those in the skull. The first difference is the *short tail* (92 per cent. of head and body), but I dare not use this character with certainty because the somewhat blunt tip of this tail makes it possible that it is incomplete. A second more important point is supplied by the short hind foot (21 mm., which is certainly a very small size for an adult *R. concolor*, though it is not absolutely impossible for this species). The main difference, however, is the very different colour of the ventral fur. In all subspecies of *concolor* known to me, this underside has quite or nearly the same colour over the whole of its surface, but here the chin, throat, and breast are grey (the bases of the hairs dark grey, the rather long tips whitish or yellowish), not sharply defined at the sides; but on the posterior part of the underside the dark colour of the back extends over the belly, joining in the middle. Certainly this is a rather unusual pattern, not only in *P. concolor*, but, I believe, in rats in general (with the exception of the very variable common house-rat, where, exceptionally, such a pattern may occur).

Mammæ 2+0=4! (no inguinal mammæ could be found).

Measurements of Type.—Head and body 111; tail 102; hind foot 21; ear 14. Skull: greatest length 30·7; occipito-nasal length 30·1; condylo-basal length 26·4; palatal length 15·8; zygomatic breadth 15·0; breadth of brain-case 12·2; postorbital constriction 4·7; length of nasal 11·0; breadth of combined nasals 3·2; diastema 7·7; palatal foramina 5·5; length of upper tooth-row 5·0 mm.

Remarks.—I may exclude at once the possibility that this rat may be a *local* (Pontianak) race of *R. concolor*. Firstly, the differences do not appear to bear a "subspecific character," and, moreover, together with the type of *R. schuitemakeri*, Mr. Schuitemaker presented me with a quite normal specimen of *R. concolor*, also collected by him at Pontianak.

Rattus concolor lassacquèrei, subsp. n. (New Guinea.)

Type (♀ ad.).—Anggi Guyi Mountain, near Manokwari, N.W. New Guinea, 1800 m., coll. Sody, no. N.G. 51.

Specimens examined.—4, all from the type-locality. These specimens were collected for me by Mr. G. de Lassacquère, who participated in the Dutch N. New

Guinea expedition, 1932–33, led by Mr. F. A. Wentholt. Mr. de Lassacquère took considerable trouble in procuring these specimens for me, and it is with very great pleasure that I name this handsome and important new form after him.

Diagnosis.—As I cannot find any differences in the skull of this rat from that of *Rattus concolor* from western islands of the Archipelago, it seems very probable that Mr. de Lassacquère's long and soft haired specimens represent a mountain race of *R. concolor*, differing from the other mountain races of that species (*equile* Rob. & Kloss of Java, *stragulum* Rob. & Kloss of Sumatra, *negrinus* Thos. of Negros, Philippines) in colour, the New Guinea form being darker on the back than *equile* and *stragulum*, and suffused with a certain amount of *brownish* on the belly, more than in *equile*, not yellowish as in *negrinus*.

Fur.—Long and soft, consisting of three kinds of hairs. The woolly hairs have a length of about 12 mm. on the back and of 6 mm. on the belly. The spines occurring on the back sometimes rather numerous, but they are always very thin and soft and thus not very striking. The bristles not very long, not exceeding about 15 mm.

Colour.—Over the middle of the back the general colour is very dark, blackish brown. The separate woolly hairs on the back are dark grey with brown tips. On the middle line of the back these light tips are very short and the bases of the hairs very dark. The bristles, which are most numerous on the middle of the hind back, are black (the spines rather light grey). Towards the sides the general colour becomes much lighter: the light tips of the woolly hairs becoming longer and the colour of the bases changing into a lighter shade of grey. On the belly, which as a whole is much lighter-coloured than the back, the bases of the separate hairs are also dark slaty, with the very light tips rather long. These tips are of a darker or lighter shade of brownish. Definition between the colours of back and belly rather indistinct. Fore feet white, with a dark median line; hind feet similar, but with the median line reaching only from the base to half the total distance. Tail unicolorous dark.

Tail rings 12–13 per cm.

Mammæ 2+2=8.

Measurements of Type.—Head and body 107 ; tail 121 ; hind foot 25·5 ; ear 17. Skull : greatest length 32·9 ; occipito-nasal length 32·4 ; condylo-basal length 28·0 ; palatal length 17·2 ; zygomatic breadth 15·8 ; breadth of brain-case 13·8 ; interorbital constriction 5·3 ; length of nasal 12·0 ; breadth of combined nasals 3·4 ; diastema 8·3 ; palatal foramina 5·9 ; length of upper tooth-row 5·7 mm.

Remarks.—The discovery of this mountain race of *R. concolor* in New Guinea is extremely interesting, because it seems to indicate that the species is not a recent introduction into the island. On several occasions Thomas has written about "the *concolor* group" or even "the *ephippium* group" (1922) of the New Guinea and Australian areas, thereby referring to *Rattus browni, Rattus gestri, Rattus exulans, Rattus maorium.* However, none of these forms are subspecies of *R. concolor.* Real *concolor* has been reported from many Molucca islands, and in my own collection is a specimen collected at Manokwari, N. New Guinea. Though these specimens are as yet insufficiently studied, all of them seem to be *lowland* forms, and one is inclined to suppose them to be rather recently introduced by man into these eastern islands. However, with such a typical mountain race as *lassacquèrei* matters may differ—though we have to acknowledge that, properly, here also we do not know exactly what is the value of such a subspecies nor how long it has taken to reach its development. Therefore it may be wise to speak in a supposing form only : *if* really this rat is a subspecies of *concolor* (and I feel quite sure about this), and *if* really the occurrence of such a typical mountain race can prove that the species has not been *recently* introduced, then Mr. de Lassacquère's discovery is of extremely large zoo-geographical importance, as, in that case, this rat would be the first non-flying mammal, not recently introduced, which inhabits at the same time the Sunda Islands (and the continent of Asia) and New Guinea.

Rattus vanheurni, sp. n. (New Guinea.)

Type (♀ ad.).—Vicinity of Manokwari, N.W. Dutch New Guinea coll. Sody, no. N.G. 6.

Specimens examined.—7, all from the type-locality.

Diagnosis.—A small rat, size of head and body only slightly larger than in *Rattus concolor*, but with much larger feet, skull, and teeth, and with the tail averaging shorter than the length of head and body. Fur without spines. Upper incisors much lighter yellow than in *concolor*.

Fur.—Soft, consisting of two kinds of hairs: woolly ones, rather sparsely set and maximal 7 mm. in length, and longer very slender bristles, especially on the hind back, not exceeding 15 mm. in length.

Colour.—The whole of the dorsal side dark grey with a distinct suffusion of brownish, caused by the coloured tips of the woolly hairs. Belly a much lighter shade of pure grey. Definition rather indistinct. The separate hairs of the belly-fur are much lighter-coloured at their tips than at their bases. Fore feet white with a very faint dark median line, hind feet white. Tail unicolorous blackish.

Tail rings 15–16 per cm.

Mammæ 3+2=10 (? observed twice—yet I do not feel absolutely sure about this point).

Measurements of Type.—Head and body 140; tail 125; hind foot 31; ear 18. Skull: greatest length 35; condylobasal length 30·5; palatal length 18; zygomatic breadth 17; breadth of brain-case 15·5; interorbital constriction 6; length of nasal 13; breadth of combined nasals 4; diastema 9; palatal foramina 6·5; length of upper tooth-row 6·7 mm.

Name.—It is a great pleasure for me to name this species after my friend Mr. W. C. van Heurn, the zoologist of the Memberamo Expedition, 1920, who collected among others such an extremely fine and important series of New Guinea mammals in the interior of the island. His collection was sent by the Buitenzorg Museum to Mr. Thomas of the British Museum for determination, and it was found to contain no less than nine new species and three new subspecies (Ann. & Mag. Nat. Hist. ser. 9, vol. ix. 1922, pp. 261–265), the types of which are in the British Museum. In 'Nova Guinea,' xiii. 1922, pp. 723–740, a full description of Mr. van Heurn's collection of mammals was given by Thomas. The remainder of his collection (without the types) is now in the Buitenzorg Museum, some duplicates are in my collection.

Rattus rattus moluccarius, subsp. n. (Boeroe.)

Type (♂ ad.).—Boeroe, coll. Sody, no. "Boeroe 9."

Specimens examined.—7 from the type-locality and 24 from other Molucca islands.

Diagnosis.—A house-rat, distinguished from the more western races by its short tail (averaging about 100 per cent. of the length of head and body), in which respect it agrees with *R. r. samati* Sody, of Bali, and *R. r. santalum* Sody, of Soemba. From these two races, however, it differs in the length of the upper tooth-row. Whilst in fourteen specimens of *samati* the *largest* tooth-row measures 7·0 mm. (average 6·69 mm.), and in five specimens of *santalum* the *smallest* tooth-row measures 7·8 mm. (average 8·23 mm.), in the 7 Boeroe specimens of *moluccarius* the *average* is 7·39 (extremes 6·8–7·9) mm.

Mammæ $2+3=10$.

Measurements of Type.—Head and body 163; tail 174; hind foot 37; ear 21. Skull: greatest length 46·3; occipito-nasal length 46·3; condylo-basal length 40·7; palatal length 25·3; zygomatic breadth 21·3; breadth of brain-case 17·2; interorbital constriction 7·1; length of nasal 16·4; breadth of combined nasals 5·0; diastema 13·0; palatal foramina 9·0; length of upper tooth-row 7·8 mm.

Rattus rattus septicus, subsp. n. (Banda.)

Type (♀ ad.).—Banda-Neira, coll. Sody, no. "Banda 1."

Specimens examined.—8 from the type-locality and 16 from neighbouring islands.

Diagnosis.—A house-rat, distinguished from all the western forms (and especially from its geographical neighbour, *moluccarius*) by its longer tail (averaging about 113 per cent. of the length of head and body). The tooth-row measures somewhat shorter than in *moluccarius*, viz. 6·4–6·99–7·3 mm. (in 7 Banda specimens).

Mammæ $2+3=10$.

Measurements of Type.—Head and body 166; tail 193; hind foot 37; ear 20·5. Skull: greatest length 42·4; occipito-nasal length 41·2; condylo-basal length 38·2; palatal length 23·8; zygomatic breadth 20·1; breadth of brain-case 15·5; interorbital constriction 6·2; length of nasal 15·7; breadth of combined nasals 4·3; diastema 11·3; palatal foramina 7·9; length of upper tooth-row 7·3 mm.

Mus musculus fredericæ, subsp. n. (Celebes.)

Type (♀ ad.).—Poso, M. Celebes, coll. Sody, no. P. 164.

Specimens examined.—8, 2 from Poso, M. Celebes, and 6 from Minahassa, N.E. Celebes.

Diagnosis.—This new Celebes form of the common house-mouse is at once distinguishable from that of the western and southern islands by its much longer tail. In twelve specimens from Sumatra, Java, and Bali the tail is only 92–114 (averaging 103) per cent. of the length of head and body. In seven Celebes specimens the tail measures 114–140 (averaging 124) per cent. of the length of head and body. So far as I can see at present, there are no other differences between *homourus* Hodgson (as the Java and Sumatra form has to be called provisionally) and *fredericæ*.

Mammæ $3+2=10$.

Measurements of Type.—Head and body 70; tail 89; hind foot 17; ear 10·5. Skull: greatest length 20·8; occipito-nasal length 19·9; condylo-basal length 17·4; palatal length 10·1; zygomatic breadth 10·8; breadth of brain-case 9·3; interorbital constriction 3·9; length of nasal 7·2; breadth of combined nasals 2·3; diastema 5·1; palatal foramina 4·7; length of upper tooth-row 3·5 mm.

Hylomys suillus maxi, subsp. n. (Sumatra.)

Type (♂ ad.).—Giesting, Lampoengs, S. Sumatra, coll. Sody, no. G. 25.

Specimens examined.—6, the type, and 5 more specimens from Atjeh, N. Sumatra.

Type-locality of Hylomys suillus *Muller* (*not Muller & Schlegel*).—Robinson and Kloss (Journ. F.M.S. Mus. viii. 1918, p. 20) wrote that Sumatra is the *first* locality mentioned by Muller and Schlegel in their description (' Verhandelingen,' 1839–44, p. 153). This is true, but the name *H. suillus* had already been given (accompanied with a description) by Muller alone (p. 25 of this same work), and there *Java* is the first-mentioned locality. As, furthermore, the animal on pl. xxvi. is an example from Java (Jentink, Cat. Syst. Mamm. Mus. Pays-Bas, xii. 1888, p. 120), and Robinson and Kloss did not *fix* Sumatra as the type-locality, I here propose to fix Java as such.

Diagnosis.—A sufficiently large and constant difference from my large series of Javanese specimens lies in the colour of the back. The hairs there are dark bluish grey at their bases, with lighter-coloured tips. In the Javanese specimens these tips are clearly yellowish, in the Sumatran they are more orange or brownish with, especially on the hind back, a reddish tinge. There is also a difference in the colour of the underside, the Javanese being generally rather plain grey, whilst in the Sumatran these parts are more yellow brownish (buffy). Generally this second difference is also clear, though it is not so constant as the difference in the colour of the back (one Javanese, from Goenoeng Slamet, has nearly the same richly-coloured belly as the Sumatran, and two other specimens from Tjiboeni, Bandoeng, are intermediate). As to the back-colour, however, after I had mixed all the Javanese and Sumatran specimens in my collection, my wife picked out the latter without difficulty, paying attention merely to this colour of the back. Besides there are important differences in the skull. In my six Sumatra specimens the upper tooth-row measures 18·5–20·1 (averaging 19·0) mm.; for 18 Java specimens I find 17·0–18·5 (averaging 18·0) mm.

Measurements of Type (with those of an ad. ♀ from Atjeh, N. Sumatra, in parentheses).—Head and body 142 (142); tail 14 (14); hind foot 25 (24); ear 16 (16). Skull: greatest length — (36·5); occipito-nasal length — (33·5); condylo-basal length — (33·2); palatal length 21·1 (20·2); zygomatic breadth 21·0 (20·2); breadth of brain-case — (15·1); interorbital constriction 10·1 (9·3); median length of nasals 11·2 (12·7); anterior breadth of combined nasals 2·9 (2·8); length of upper tooth-row 20·1 (18·7) mm.

Remarks.—I name this new form after Mr. Max Bartels, Jr., because it was the rich Java material caught for me and presented to me by Dr. Bartels that enabled me to distinguish the new form. For examining the Atchinese specimens I have to thank Mr. F. J. Nainggolan.

Paradoxurus hermaphroditus balicus, sp. n. (Bali.)

Type (♂ ad.).—Boeleleng, N. Bali, coll. Sody, no. E. 109.

Specimens examined.—2 ♂, Sendang, N.W. Bali; 2 ♂, Boeleleng, N. Bali.

name, and therefore Batavia is the type-locality of the species. Horsfield's name *leptonyx*—having no more exact locality than Java—I consider to be a synonym of *cinerea*.

XLII.—*The Dates of Publication of ‘Synopsis des Diatomées de Belgique,’ by Henri Van Heurck.* By G. DALLAS HANNA, California Academy of Sciences, San Francisco.

ONE of the classics of the literature of diatoms is the great ‘Synopsis’ by Van Heurck. It was published in Anvers during the years 1880–1885, and was prepared in considerable part with the co-operation of Albert Grunow. The atlas of plates appeared first, and was issued in six parts of variable size; the original title-page bears the date “1880–1881,” but the last part was not published until 1883. Apparently a considerable number of the copies printed were bound in the form which characterizes most of Van Heurck's other writings.

Since the work contains illustrations of diatoms from many parts of the world other than Belgium, living as well as fossil, it is highly desirable that the date of issue of each plate be ascertained. I have worked this out through an examination of contemporary reviewing journals with the following results:—

Fasicule Number.	Plates.	Date.	Authority.
1, 2.	1–30, 22 *bis*.	1880.	Journ. Roy. Micr. Soc. vol. iii. 1880, p. 687.
3.	31–33.	1881.	Journ. Roy. Micr. Soc. ser. 2, vol. i. 1881, p. 648.
4.	34–77, 53 *bis*.	1881.	Bot. Centralbl. vol. vii. 1881, p. 353; Just's Bot. Jahresber. 1881 [1884], abt. 1, heft 2, pp. 373, 377.
5.	78–103, 82 *bis*. 83 *bis*, 83 *ter*, 95 *bis*.	1882.	Just's Bot. Jahresber. 1882 [1885], abt. 1, heft 2, p. 340.
6.	104–132.	1883.	Just's Bot. Jahresber. 1883 [1885], abt. 1, heft 1, pp. 224, 229.

The atlas is often referred to as “part 1” of the entire work.

“Part 2” is text, 120 pages, and contains an alphabetical index of the names of genera and species contained in the atlas. It appeared in 1884 (Junk, Rara Hist. Nat. e Math. 1900–1913, p. 66).

"Part 3" is the chief descriptive part of the text. It contains 235 pages and three supplementary plates, A, B, C, and was published in 1885 (Junk, Rara Hist. Nat. e Math. 1900–1913, p. 66).

There is nothing on the title pages of the bound copies of the work which I have examined to show that the author indicated the segregation of the material into the three designated "parts."

May 19, 1933.

XLIII.—*On some Parasitic Worms from Java, with Remarks on the Acanthocephalan Genus* Pallisentis.

By H. A. BAYLIS, M.A., D.Sc., Department of Zoology, British Museum (Natural History).

A SMALL collection of parasitic worms from Java was recently forwarded to the writer for determination by Dr. Prosper Bovien, who has kindly presented it to the British Museum (Natural History). The following species were included in the collection.

Nematodes.

Contracæcum spiculigerum (Rud., 1809), from *Phalacrocorax pygmæus* and *Plotus melanogaster*.

Contracæcum tricuspe (Gedoelst, 1916), from *Plotus melanogaster*.

Strongyluris calotis Baylis and Daubney, 1923, from *Calotes jubatus*.

Necator americanus (Stiles, 1902). Several specimens from the large intestine of a pangolin (*Manis javanicus*) appeared to be indistinguishable from this common human parasite. Apart from man, *N. americanus* has been recorded as an occasional parasite of the chimpanzee, gorilla, certain monkeys, dog, pig and rhinoceros.

Kalicephalus naiæ Maplestone, 1931, from *Bungarus fasciatus*.

Kalicephalus fimbriatus (Ortlepp, 1923), a single female from *Bungarus fasciatus*.

Tanqua tiara (v. Linstow, 1879), from *Varanus* sp.

In addition to the above-mentioned species the collection included some fragmentary specimens of an undetermined Filariid. These were found in the connective tissue between the ovaries and kidneys of *Rana tigrina*.

Acanthocephala.

Centrorhynchus sp. (*a*). Larval forms from the subperitoneal and intermuscular connective tissue of *Mabuia* sp., *Zamenis korros* and *Rana tigrina*. These may possibly be identical with *Echinorhynchus serpenticola* v. Linstow, 1907, which was originally recorded from *Psammodynastes pulverulentus* in Java.

Centrorhynchus sp. (*b*). A larval form from the peritoneum of *Bungarus fasciatus*.

Pallisentis nagpurensis (Bhalerao, 1931), from *Ophiocephalus striatus*, *Ophiocephalus* sp. (See discussion of this species below.)

Cestode.

Bothridium sp. A few small cysts in the liver of a krait (*Bungarus fasciatus*) proved to contain larval Cestodes which, on morphological grounds, are considered to be plerocercoids of *Bothridium*. They have a scolex with two large bothria having an aperture at each end, as in the adult of the typical species, *B. pithonis*. Nothing appears to be known of the life-history of this genus except that Solomon (1932) has found that *Cyclops viridis* readily ingests the coracidia of *B. pithonis*, and has observed the development up to the procercoid stage in this host.

Pallisentis nagpurensis (Bhalerao, 1931).

Syn. *Farzandia nagpurensis* Bhalerao.

The collection includes two sets of specimens of an Acanthocephalan worm from the intestine of (a) *Ophiocephalus striatus* and (b) *Ophiocephalus* sp. Both were collected in July 1923. The worms undoubtedly belong to the genus *Pallisentis* Van Cleave, 1928, of which the writer considers *Farzandia* Thapar, 1930, a synonym.

Four species of *Pallisentis* appear to have been described up to the present, viz., *P. umbellatus* Van Cleave, *P.* [*Echinorhynchus*] *gaboes* (MacCallum), *P.* [*Farzandia*] *ophiocephali* (Thapar) and *P.* [*Farzandia*] *nagpurensis* (Bhalerao). All are from Oriental freshwater fishes. Unfortunately it is impossible to determine from the descriptions of these four species whether they are all distinct and valid. The description of *P. gaboes* is very incomplete, and several of the measurements given are very remarkable, and must be erroneous. Thus the thickness of the body in the female is given by MacCallum as " 70 μ," the dimensions of the proboscis as " 45 μ long by 25 μ wide," the length of the largest hooks on the proboscis as " 7 μ," and the dimensions of the eggs as " 10 μ long by 5 μ wide." If all these measurements were multiplied by 10 they would become more comparable with the corresponding figures for the other species.

The present specimens seem to approach more closely to *P. nagpurensis* than to any of the others. The number of hooks in each of the four transverse rows on the proboscis appears to be constantly 10. This number is given as 6 in *P. umbellatus*, 8 in *P. ophiocephali*, and " 8 or 10 " in *P. nagpurensis*. In size, again, the worms approach very closely to *P. nagpurensis*. The males measure 6·5–12 mm. in length, the females up to 21 mm. The maximum thickness, however, in either sex does not exceed 0·6 mm. Bhalerao gives the length of his specimens as 2·4–19 mm. and their thickness as 0·43–0·9 mm. *P. umbellatus*, *P. gaboes*, and *P. ophiocephali* apparently do not exceed 10 or 11 mm. in length in the female.

In all the species there is a specialized spiny anterior region of the body, bearing a varying number of closely set transverse rings of spines, and this is followed by a region of varying extent bearing more widely spaced rings of spines. In the present specimens the first region bears 12–15 rings of spines, the second 40–50 rings. These do not extend to the posterior end of the body, and in the male seldom extend behind the anterior testis. In *P. nagpurensis* there are said to be 12–14 rings in the anterior region and 30–63 in the posterior. These apparently extend to the posterior region in the female, but in the male " there is a tendency for the rings of spines in the post-testicular region to disappear " (Bhalerao). In *P. umbellatus* the number of rings in the anterior region is usually nine (Van Cleave), in *P. gaboes* (from MacCallum's figure) apparently 13, and in *P. ophiocephali* 11 according to Thapar. The posterior rings number only 11 (or 12 ?) extending a little behind the middle of the body, in MacCallum's figure of the male of *P. gaboes* ; 20–40, not reaching the posterior extremity, in *P. umbellatus* ; while in Thapar's figure of the male of *P. ophiocephali* 52 are shown, extending throughout the whole length of the body.

The proboscis, according to Van Cleave, has a diameter of about 0·2 mm. in *P. umbellatus*. In *P. ophiocephali* it is said to be 0·18 mm. in length, and from the figures it appears to be about 0·23 mm. in diameter in the male. In *P. nagpurensis* "the proboscis in an average-sized specimen measures 0·35×0·3 [mm.]" (Bhalerao). It is not stated which measurement refers to the length and which to the diameter, but from the scales given with the figures the latter appears to be between 0·2 and 0·3 mm. MacCallum's measurements for *P. gaboes* have already been mentioned. In practice the length of the proboscis seems to be of little value, since it is difficult to fix its limits. The maximum diameter of the proboscis in the writer's specimens is 0·23–0·25 mm., which agrees fairly well with *P. nagpurensis* (and also with *P. ophiocephali*).

The lengths of the hooks in the four rows on the proboscis appear to vary within rather wide limits (see table below), but in this respect again the species is nearest to *P. nagpurensis*.

Lengths (in μ) of the Hooks on the Proboscis in Species of Pallisentis (=Farzandia).

	P. umbellatus Van Cleave.	*P. ophiocephali* (Thapar).	*P. nagpurensis* (Bhalerao).	Presei specimei
ior) row .	89–119	110	76	70–90
Second row........	83–100	50	..	56–70
Third row	53–65	40	..	36–48
Fourth row........	35–41	30	30	26–34

There is so little uniformity in the manner in which the size of the eggs is given by the different authors that this is at present useless as a specific character. There is, in this respect, a rather large discrepancy between the writer's material and *P. nagpurensis*, as described by Bhalerao. The outside measurements of the eggs in the present material are about 0·09–0·096 ×

0·04 mm., and those of the embryos, whether enclosed in shells or not, 0·036–0·05×0·016–0·02 mm. The measurements given by Bhalerao are very much larger (eggs 0·116–0·214×0·083–0·115 mm.; embryos 0·112×0·07 mm.).

In view of the various arguments detailed above it seems preferable to refer the present material to *P. nagpurensis* rather than to add yet another species to a genus whose known members are so difficult to separate.

Note on Pallisentis, Farzandia, *and related Genera.*

The latest and most comprehensive of several recent classifications of the Acanthocephala is that of Meyer (1932). In the system adopted by Meyer the genus *Farzandia* is not only distinguished from *Pallisentis* but placed in a different family. The family Acanthogyridæ * of Meyer contains only the genera *Acanthogyrus* Thapar, 1927, and *Farzandia* Thapar, 1930. *Pallisentis* is placed in the family Quadrigyridæ Van Cleave, 1920 (emend. Meyer, 1931). Meyer does not appear to have seen the description of *Farzandia nagpurensis* Bhalerao, and his diagnosis of *Farzandia* is based solely on *F. ophiocephali*—hence his statement that the vascular system of the genus is unknown. Bhalerao has described a vascular system in which there are two lateral longitudinal canals and a series of transverse commissures †. Since the vascular system of *Pallisentis* is undescribed, and the only difference mentioned between *P. umbellatus* and *Farzandia ophiocephali* that could possibly be regarded as generic is the number and extent of the rings of spines on the body, it is difficult to understand on what grounds these genera are separated. The generic characters enumerated by Thapar (1930, p. 79) and quoted by Meyer for *Farzandia* indicate, in the writer's opinion, its identity with *Pallisentis*, and not its distinctness from that genus.

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* Meyer quotes the author of this family as "Meyer, 1931." Such a family was, however, proposed by Thapar (1927), though with quite different contents.

† Bhalerao states that the longitudinal canals are lateral and that the transverse commissures correspond in number "to the rings of spines on the body and to the dimples in the cuticle in the non-spiny region of the males." In the writer's material a pair of conspicuous longitudinal canals can be seen in some specimens, though it is not certain whether they are lateral in position. The transverse commissures are not so simply and regularly arranged as is indicated by Bhalerao, but anastomose among themselves to form a network.

Concerning the genus *Neosentis*, Van Cleave (1928) says that " though this genus seems to be rather closely related to the genus *Pallisentis*, there are many significant points of difference in regard to the body-spines, the form of the proboscis and of its hooks, and the nature of the receptacle of the proboscis." With the exception of the size and arrangement of the spines on the body, the nature of these differences is not clear from the description, nor is any important distinction between the genera brought out in Meyer's (1932) diagnosis. It appears to the writer probable that the differences between *Neosentis celatus* Van Cleave and the various forms already discussed are only of specific importance.

In any case, if the families Acanthogyridæ and Quadrigyridæ, as defined by Meyer, be regarded as distinct, it is difficult to determine to which of them the genera *Pallisentis* (including *Farzandia*) and *Neosentis* should be assigned.

The vascular system in *Acanthogyrus* consists of a pair of longitudinal canals and a regular series of transverse connecting vessels, but the cement-glands are paired and polynuclear and the lemnisci relatively short and club-shaped. In *Quadrigyrus* the vascular system is an irregular network, while the cement-glands form a single syncytial mass and the lemnisci are similar to those of *Acanthogyrus*. In *Pallisentis* and *Neosentis* we find a single syncytial cement-gland and very long cylindrical lemnisci. In the former (or at least in *Farzandia*) the vascular system seems to be intermediate in character between that of *Acanthogyrus* and that of *Quadrigyrus*, while in *Neosentis* it is undescribed.

In view of the fact that the characters of the families overlap to such an extent, it seems reasonable to suggest that the family Acanthogyridæ should be suppressed, and all the genera under discussion be included in a group corresponding to the family Quadrigyridæ. This family was reduced by Travassos (1926) to a subfamily, Quadrigyrinæ, of the family Neoechinorhynchidæ, an arrangement which has been followed by Witenberg (1932) and which seems to have much to commend it, though it would be difficult to reconcile with Meyer's system.

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XLIV.—*Some new or little-known Rhynchota from China.*

By Dr. O. LUNDBLAD.

[Plate XIII.]

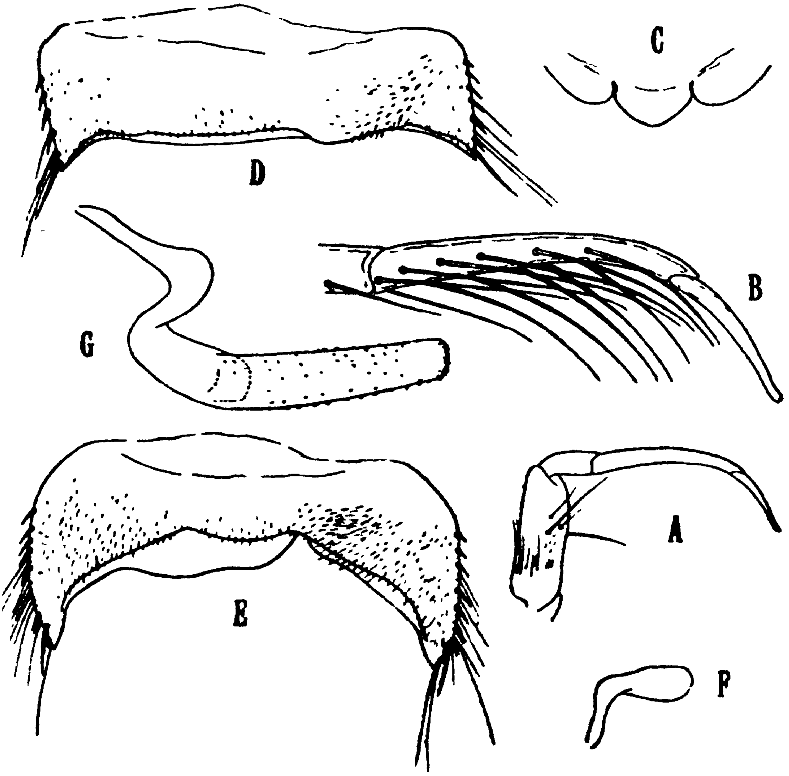
THE following Corixidæ and Notonectidæ have been collected by Prof. Dr. Chenfu F. Wu, Yenching University, Peping (Pekin), and sent to Mr. W. E. China, British Museum, London, who has forwarded them to me for study. I am deeply obliged to Mr. China for giving me this opportunity of studying this interesting material from the Far East. The species are either new to science or little known. A new species, received some years ago from Prof. Dr. A. N. Kiritshenko in Leningrad, has been added, Types of all species are preserved in the Swedish State Museum of Natural History, Stockholm, and specimens of most species have been presented to the British Museum of Natural History, London.

1. *Cymatia apparens* (Dist.). (Pl. XIII. fig. 4; text-fig. 1.)

Corixa apparens Distant, 1910, p. 343.
Cymatia apparens Jaczewski, 1928, p. 107.

Some years ago Dr. Jaczewski was able to state that *Corixa apparens* of Distant is a *Cymatia*. He has published a careful redescription of the species. In most details the specimens before me agree exactly with Jaczewski's description and drawings, so it is unnecessary to describe them fully here. In some respects, however, there are some slight differences, which are worth while to be noted.

Text-fig. 1.



Cymatia apparens (Dist.), ♂.

A, anterior leg; B, pala; C, metaxiphus; D, sixth, E, seventh abdominal segment; F, right, G, left paramere.

According to Distant and Jaczewski the pronotum is unicolorous, without fasciæ. However, all specimens studied by me, viz., the female type and another specimen (a male) in the British Museum, collected by Campbell in Chikkaballapura in South India, and both examples before me (a male and a female from Peping) have the pronotal disc quite distinctly transversely barred, though the lines are but slightly marked.

The head is not, as Distant says, " strongly centrally longitudinally ridged," whereas Jaczewski's description as to the present character seems quite adequate, the vertex only being obtusely ridged. Like Jaczewski's specimens also mine have fully developed wings.

Distant maintains that the posterior tarsi are broadly streaked above with black, but this error of observation is due to the fringe of dark hairs bordering the yellow tarsus.

The pala in *Cymatia* is characterized by total absence of dorsal hairs, by having a very large end-claw, and by the possession of few, but strong and robust, inner and outer bristles, situated as usual in two rows along the ventral side. Also the delicate hairs, situated ventrally between the two rows in *Sigara*, are present here, but they are much stouter, bristle-like, and less numerous. A figure of the pala is given here to illustrate these structures, the last-mentioned bristles being omitted for the sake of distinctness.

Also of the abdominal segments 6–7, figures are submitted here. They will explain better than words the specific structures peculiar to this species.

Lastly, it may be pointed out that the left paramere inwardly is provided with a big process (dotted in the figure).

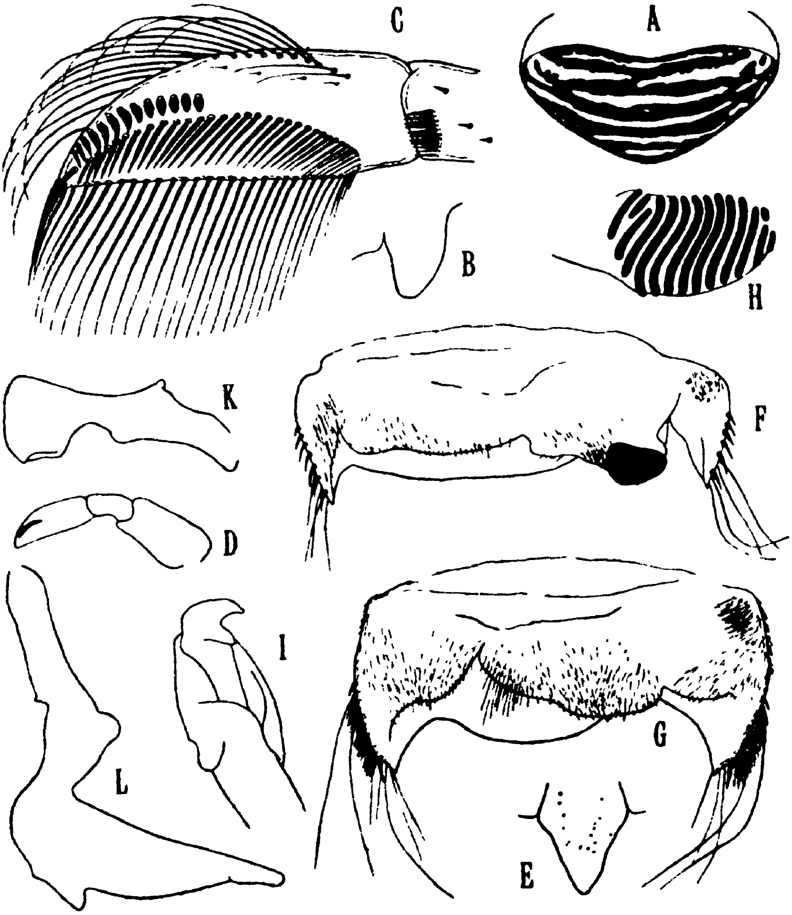
Locality.—The specimens were collected in Peping. *C. apparens* has been reported before from Calcutta (type-locality) and Chikkaballapura in India, and from Yenchowfu, Prov. Schantung, in China.

2. *Sigara vittipennis* (Horv.). (Pl. XIII. fig. 3 ; text-fig. 2.)

Corisa vittipennis Horváth, 1879, p. 151.
Sigara horni Jaczewski, 1928, p. 110.

Through the courtesy of Prof. Horváth I have had the opportunity of studying the type of *S. vittipennis*, which is a female, in the Hungarian National Museum, Budapest. There can be no doubt that *Sigara horni*, described by Jaczewski from China, is conspecific. In the present material there are a male and a female, the male of which

Text-fig. 2.



Auct. del.

Sigara vittipennis (Horv.), ♂.

A, pronotum ; B, lateral prothoracic lobe ; C, pala ; D, anterior leg ; E, metaxiphus ; F, sixth, G, seventh abdominal segment ; H, strigil ; I, end of genital capsule ; K, right, L, left paramere.

I have dissected and compared with the *vittipennis*-type and with Jaczewski's drawings of *horni*. The latter is an extremely characteristic species, and my specimen fits very well the description of *horni*. The *vittipennis* type agrees well with my specimens and with others from Tsinan, China, which I received from the British Museum for determination, except that the yellow markings on pronotum and hemielytra are somewhat broader in the *vittipennis* type than in the specimens investigated by Jaczewski and myself. The rather slight difference in colouring is of no distinctive value.

S. vittipennis is a well-marked pretty-coloured species. It will not be described again here, although some drawings have been given to supplement those of Jaczewski. It may be pointed out that the lateral prothoracic lobes are neither so long produced nor so parallel-sided, and that I have not seen any specimens having the posterior margin of the pronotum so obtusely rounded, without an angle, as in Jaczewski's figure, but in other respects the concordance seems to be fairly good. The number of stridulatory pegs varies between 13 and 14.

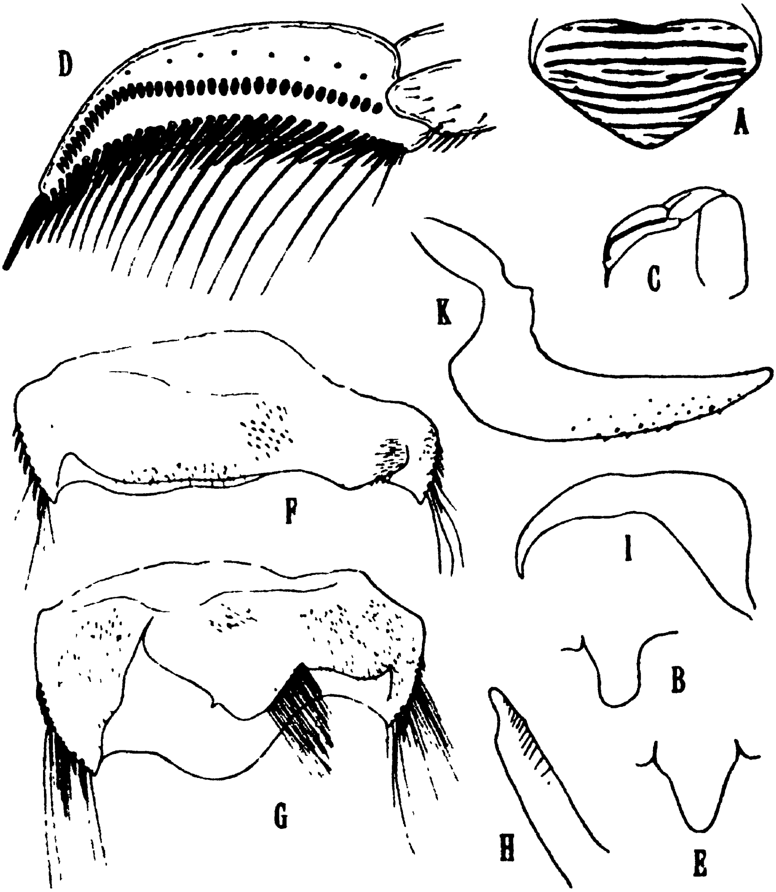
Locality.—The specimens before me come from Peping. Those described by Jaczewski were from Yenchowfu, Prov. Schantung, and Horváth's type was from Sobsam-Timbu. In the British Museum I have seen specimens from Tsinan, collected in a clear lake on October 3rd, 1928, by A. P. Jacot. All the above localities are situated in China, and the species has not so far been found outside that country.

3. *Callicorixa wui*, sp. n. (Pl. XIII. fig. 1 ; text-fig. 3.)

This species attains a length of about 6·5–7 mm. Like all other species of the genus it has no strigil, and it agrees with most of them even in the posterior tarsi being darkened.

The frontal fovea is well marked and fairly deep, covered with long yellow hairs. The posterior part of the vertex is feebly longitudinally keeled, and the keel projects backwards to constitute an angular projection of the head. The postocular space of the head is rather broad at the inner corner of the eyes, but decreases rapidly laterally. Pronotum and clavus strongly, corium at the base slightly, rastrated Marginal area of hemielytra very broad. Pronotum with a short keel in front, with broad, parallel-sided, at the end obtusely intercepted lateral lobes, and distinctly marked though obtuse lateral angles. Metaxiphus of medium length. The posterior pronotal margin is angularly produced in the middle and the pronotal disc is provided with about nine transverse dark lines, which are narrower than the yellow ones. The dark markings of the hemielytra are also narrower than the pale ones. On the anterior part of clavus they are rather regularly arranged in uninterrupted transverse lines, whereas the corium is graced

Text-fig. 3.



Auct. del.

Callicorixa wui, sp. n., ♂.

A, pronotum ; B, lateral prothoracic lobe ; C, anterior leg ; D, pala ; E, metaxiphus ; F, sixth, G, seventh abdominal segment ; H, end of genital capsule ; I, right, K, left paramere.

by a great number of irregular short stripes, not placed in rows. The membrane-suture is marked by a yellow streak. The hemielytra are covered by long, light, scattered hairs.

The pala of the male much elongated, apically pointed. The number of long upper hairs amounts to 11 and the short inner bristles and the long outer bristles of the pala underside are about 30–33 and 19 respectively. The long row of stridulatory pegs at first runs rather straight to the upper margin of the pala, and then bends downwards in a curve, following the margin. It consists of 37–38 pegs, all of which are small and of about equal size, the distal ones, however, being a little narrower and more pointed. All the inner bristles are stout, constituting an uninterrupted row right to the tip of the pala. The distal bristles of the outer row are characterized by being blunt at the apex and much stouter than the proximal ones. The anterior tibia is keeled and the hairy area of the femur is large, reaching the middle. There are only hairs, no spines, but some hairs are slightly thickened. About 24 spines are inserted between the hair-covered area and the end of the femur, some of them being arranged in groups of 2–4 together.

The relative length of femur, tibia, tarsus, and claws in the intermediate leg is as follows:—62, 28, 21, 22. The first segment of the posterior tarsi is characterized by having a small but very distinct dark spot at the very tip, extending from about the middle of the apical margin of the segment to the flexor side. The base of the second segment is somewhat darkened. The upperside of the posterior femur possesses about 14, the underside about 30 spines.

The tergite of the sixth abdominal segment is furnished in the middle with a group of strong spines. The most striking characteristic of the following segment is the shape of the central tergite-tongue, the left margin of which has a peculiar, small, but well-marked process. The right margin (as usually) is bordered by a fringe of hairs, which, however, does not reach the very tip of the tongue. The right margin of the segment is angularly bent somewhat in front of the middle.

The end process of the genital capsule is simple and striated near the tip. The right paramere is also of a very simple shape, not much differing from that of *Callicorixa wollastoni* (Dgl. & Scott). It is uniformly curved and sharply pointed. The left paramere has a great number of small spines.

Locality.—There are two specimens, a male and a female, from Tientsin.

4. *Callicorixa kiritshenkoi*, sp. n. (Pl. XIII. fig. 2; text-fig. 4.)

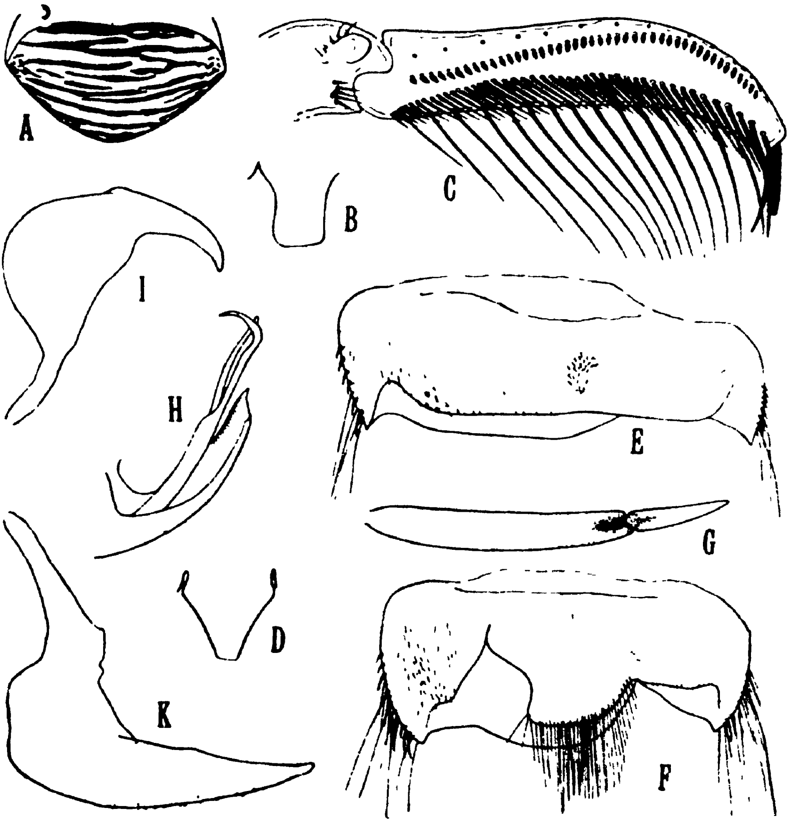
The species measures about 7·5–8 mm. in length. No strigil is developed. The frontal fovea is well developed, covered by long yellow hairs and reaching far up between the eyes. The posterior portion of the vertex has a feeble keel, projecting backwards as in the preceding species. Postocular space of the same structure. Pronotum in front with the vestige of a vanishing keel. Head, seen from above, broad, with a highly protruding though blunt forehead and strongly convex eyes, thus very much resembling the genus *Cymatia*. The pronotal disc is short and the lateral angles are obtuse, though sharp, not rounded. The lateral prothoracic lobes and metaxiphus as in the foregoing species.

Pronotum, clavus, and base of corium slightly rastrated. Marginal hemielytral area less broad than in *C. wui*. The posterior margin of the pronotum but little produced in the middle, in some specimens broadly rounded. There are about nine dark transverse lines on the pronotum; they are narrower than the yellow ones and join more or less. As a rule, the wing-covers seem to be very light, with narrow dark markings, which form a very irregular meshwork. In other, darker specimens the dark and yellow markings are distinctly transversely arranged.

The apices of the intermediate tarsi are darkened, as are also the distal part of the first segment and the basal part of the second segment of the posterior tarsi.

In some of the structural characters the present species resembles *C. wui*. The male pala is very narrow and still more elongated than in the latter. There are twelve long hairs standing along the upper margin. In accordance with the elongated shape of the pala the number of pegs and bristles is greatly increased. The pegs, about 41–44 in number, are placed in a gently curved row. They are throughout of the same shape, the distal ones being a bit smaller. The inner bristles differ from those in the preceding species by being longer and thinner. They are equally numerous, counting about 46. There is no interruption within the row.

Text-fig. 4.



Auct. del.

Callicorixa kiritshenkoi, sp. n., ♂.

A, pronotum; B, lateral prothoracic lobe; C, pala; D. metaxiphus; E, sixth, F, seventh abdominal segment; G, posterior tarsus; H, end of genital capsule; I, right, K, left paramere.

The apical claw is broken in the unique specimen. The outer row consists of about 17 bristles, the apical ones of which are of the same shape as the others, except the last bristle, which is more blunt. The tibia is unusually short, provided with a strong keel, which is heavily curved. Inside the apical end of the keel we find a rounded knob or protuberance surrounded by some hairs. The peculiar tibia presents one of the most significant features of the species. In the middle of the basal hair-field of the femur there are some spine-like thickened hairs, but they are rather thin and but little transformed. About 24 (partly in groups) arranged spines are inserted in front of the hair-field.

The relative length of femur, tibia, tarsus, and claws in the intermediate leg is as follows:—88, 35, 26, 26. The femur is provided with an extremely thick fringe of long swimming-hairs. The tarsi are apically darkened.

The dorsal surface of the posterior femur has about 13 spines.

As in the preceding species a group of spines is to be found near the centre of the tergite of the sixth segment. The seventh segment differs more; there is no projection of the left margin of the central tongue, and the border of hairs reaches the very tip. The right margin of the segment is not angularly bent, but anterior to the middle there is an exceedingly small, though clearly visible, pointed projection. The end of the genital capsule does not differ from that of the foregoing species, whereas the right paramere is quite characteristic, being very broad and swollen in the middle, with the ventral margin strongly convex there. The left paramere is rather indifferently shaped, presenting extremely small needle-shaped spines.

Locality.—Russian Turkestan, the lake Kargali-Kul in the desert Mujun-Kum, between the lakes Aral and Balkasch, 19th May, 1910 (coll. *A. N. Kiritshenko*).

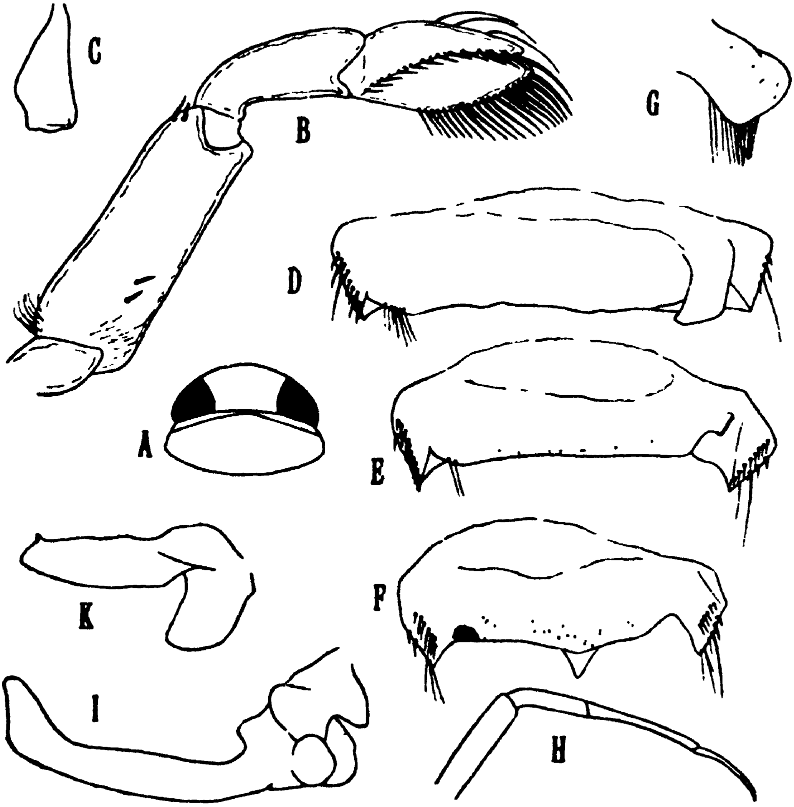
5. *Micronecta wui*, sp. n. (Pl. XIII. fig. 6; text-fig. 5.)

The present species only measures about 1·4 mm. in length. It is a very near relative of *M. minutissima* (L.), though much smaller. The colour is also much the same, though being somewhat lighter yellowish, with faint dusky specks. The wings are reduced, being of about the same size as in *M. minutissima*.

Seen from above the pronotum is longer than the head and longer than in *M. minutissima*, with well-marked lateral margins. The relative length and shape of these parts, however, much depends upon the point of observation. Considering this fact one must not lay too much stress upon statements of this kind.

The anterior leg of the male shows the usual structures of the genus and has no special characters. The femur is provided near the base with the two usual spines. The claw increases in width from the base towards the apex. It is possible, however, that the claw here figured has been damaged and that the apex originally was more regular in shape. The relative figures for the

Text-fig. 5.



Auct. del.

Micronecta wui, sp. n., ♂.

A, head and pronotum; B, anterior leg; C, anterior claw; D, fifth, E, sixth, F, seventh abdominal segment; G, tongue of eighth abdominal segment; H, intermediate leg; I, right, K, left para-different parts of the intermediate leg are:—femur 33, tibia 13, tarsus 18, and claws 12.

It is interesting to state that the shape of the highly specialized fifth abdominal segment agrees with that of *M. minutissima* (see Lundblad, 1928). On the right side of the tergite we find a large tongue of chitin, arising from the anterior part of the segment and overlapping the posterior margin. There is hardly any difference in this character in the two species. Also the segments 6–7 are very much alike. In *M. minutissima* there is a deep incision behind the strigil, and also in the present species we can trace that incision in the shape of a wide shallow bay. The right lateral margin of the segment is angular, as is also that of the following segment. As in *M. minutissima* the left portion of the posterior margin of the tergite of the seventh segment is thickened and has attained a dark brown colour. Fig. 5, G, shows the shape of the dorsal tongue of the eighth segment, which also resembles that of the species of comparison.

The right paramere is more stout in the apical part than in *M. minutissima* and swollen subapically. The left paramere again recalls that of *M. minutissima*, but differs markedly in the structure of the tip. In the species just mentioned the paramere tapers gradually into a rather big tip, whereas in *M. wui* the distal end of the paramere is cut off abruptly and the much smaller tip placed dorsally.

Locality.—Two specimens collected in Peping.

6. *Micronecta quadriseta*, sp. n. (Pl. XIII. fig. 7; text-fig. 6.)

Of this species there is unfortunately but a single damaged male specimen available at present, so that the description is necessarily somewhat incomplete. The species is much larger than *M. wui*, and attains about the same size as *M. minutissima.* The hemielytra have a marking much resembling that of *M. fugitans* Bredd.

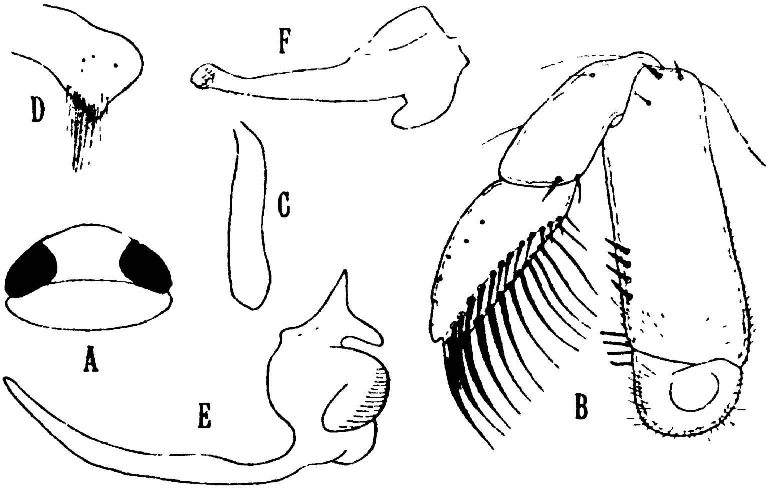
The pronotum in the mid-line is shorter than the head seen from above.

The most striking feature in the species is to be found in the male anterior leg, the femur of which possesses four instead of two spines proximal to the middle. Besides there are some equally characteristic spines arising at right angles from the very base of the femur. These latter spines differ from the others by not being pointed, but parallel-sided, or even slightly dilated apically. The ventral bristles in the outer pala-row are much thickened at their bases. The end-claw is elongated and rounded apically.

The right paramere has a large swollen base, while the rest is unusually slender. The left paramere shows about the same shape as in *M. fugitans* Bredd. or *decorata* Lundbl. The tip has a scale-like structure.

Locality.—One male from Soochow.

Text-fig. 6.



Auct. del.

Micronecta quadriseta, sp. n., ♂.

A, head and pronotum; B, anterior leg; C, anterior claw; D, tongue of eighth abdominal segment; E, right, F, left paramere.

7. *Micronecta proba*, Dist. (Pl. XIII. fig. 5; text-fig. 7.)

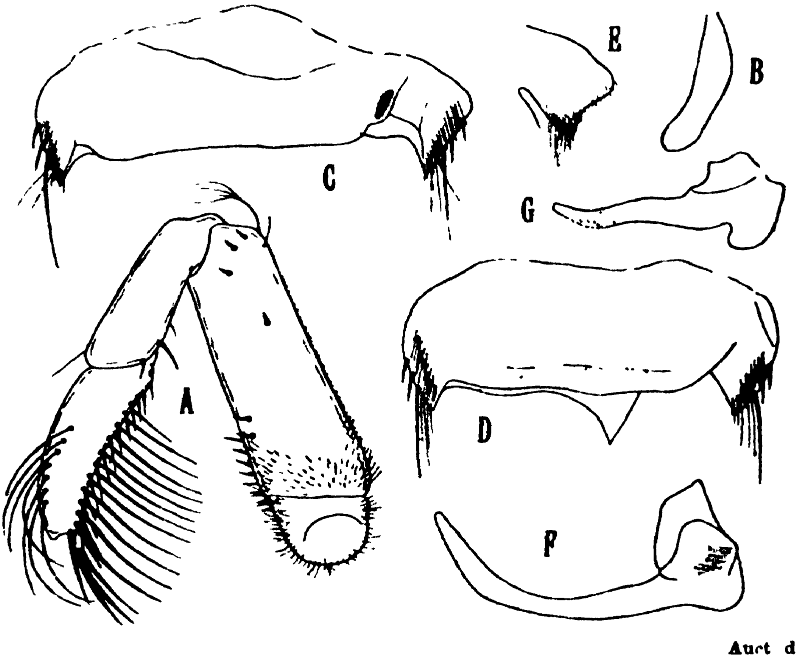
Micronecta proba Distant, 1910, p. 348.

Distant's description of this species fits very well the specimens before me, and likewise the agreement with his figure is very good, so that there cannot be any doubt as to the validity of the identification. Moreover, I have been able to compare with paratypes in the British Museum, collected at Calcutta on Sept. 9th, 1906, of which I have dissected one. Some structural details, not mentioned by Distant, might be added here.

The anterior leg is slender and especially characterized by the many spines at the base of the femur, differing in that respect from all Oriental species hitherto described. The claw is elongated, apically rounded. Otherwise the leg shows no characters of special interest.

The abdominal segments 6–7 are especially noteworthy because of the thick fringe of hairs inside the lateral margins, which possess a much greater number of bristles than in the species treated above.

Text-fig. 7.



Auct del.

Micronecta proba Dist., ♂.

A, anterior leg; B, anterior claw; C, sixth, D, seventh abdominal segment; E, tongue of eighth abdominal segment; F, right, G, left paramere.

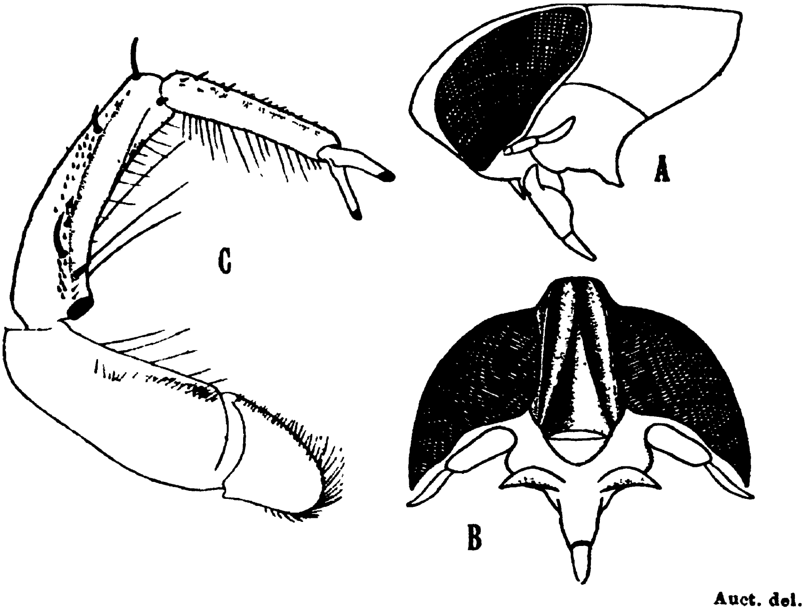
The right paramere is plainly built, whereas the left one is more characteristic. The basal lobe is relatively small and the rod shaped like the letter S. The distal portion of the rod presents a great many very small backwardly directed barbs. Most of the ones here figured are seen through the transparent rod; only those situated near the tip arise from the side facing the observer.

Locality.—Amoy. Distant reports the species from India (Calcutta, Rajshai, Lucknow) and Burma (Mandalay).

8. *Anisops batillifrons*, sp. n. (Text-fig. 8.)

The species reaches a length of about 6 mm. One of the salient features is the shape of the head in the male, which is protruded forwards like that of *A. sardea* H.-S., *A. ståli* Kirk., *A. bouvieri* Kirk., *A. genji* Hutch., and *A. nasuta* Fieb. The end of the projection is rounded, without prominent lateral angles as in *A. nasuta* and *A. ståli*. The ventral side of the projection shows two longitudinal ridges, which join in front. Lateral to the ridges there are two furrows, one on each side, and the ridges embrace a triangular concave field in the middle. Seen from beneath the projection is bordered by straight elevated margins. The prongs of the beak are rather short and broad.

Text-fig. 8.



Anisops batillifrons, sp. n., ♂.

A, head and pronotum in side view ; B, head from beneath ; C, anterior leg.

Including the projection the head, seen from above, is much longer than the pronotum, but does not attain the width of the latter.

In the genus *Anisops* the anterior leg offers the best specific characters. In the structure of the fore-leg *Anisops batillifrons* resembles *A. nivea* (Fabr.) and *A. genji* Hutch. As in these species, tibia and tarsus are provided with a great number of smaller spines and bristles. Common to all these species are two bristles at the extensor side near the base of tarsus, two spines at the distal end of tibia, one of which is situated at the extensor side, the other in the middle between extensor and flexor sides, one ventrally directed spine at some distance from the stridulatory comb arising from the flat side, and distal of that spine another very long spine. More distal still there are many small and some few larger spines in all the species: in *nivea* 3, in *genji* 2 (or 3), and in the present species 3, two of which are inserted near the long bristles, the third much farther distal. The last-named three spines are differently inserted in the three species. Likewise some of the other spines differ in shape; for instance, the peg-like spine at the distal end of the tibia is very small in *A. batillifrons*. Both spines at the base of the tarsus are also very short, whereas the bristle at extensor side of distal end of tibia is much lengthened.

Locality.—Two males collected in Foochow.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 71. NOVEMBER 1933.

XLV.—*A further Contribution to the Study of South African* Scelionidæ (*Insecta, Hymenoptera, Proctotrupoidea*). By G. E. J. NIXON, B.A.

[Continued from p. 324.]

GOVINDA, gen. nov.

Head transverse. Frons evenly convex. Cheeks not strongly produced backwards. Eyes bare or clothed with very short inconspicuous hairs. Posterior ocelli almost touching the eye-margins. Antennæ 12-segmented. The distance between the bases of the mandibles usually conspicuously long. Mandibles with two or three teeth; when there are three teeth, the middle one is very small.

Thorax not markedly elongate. Mesonotum entirely or virtually without parapsidal furrows. Postscutellum medially with a horizontal triangular or semicircular lamelliform process, which is not longer than the scutellum. Fore wings with the subcostalis well separated from the edge of the wing; marginalis considerably shorter than the stigmalis; postmarginalis present.

Abdomen somewhat narrow, spindle-shaped, not strongly narrowed at its base; the first three tergites transverse; tergite 1 with or without impressions on each side at its base; 2 by no means twice as wide apically as basally; 3 considerably longer than 2.

Type of the genus, *Govinda mila*, sp. n.

Key to the Species of Govinda.

Females.

1. When the head is viewed from in front, the distance between the angles formed by the junction of the cheek with the mandible is greater than the shortest distance between the eyes on the frons .... 2.
   When the head is thus viewed, the distance between the angles formed by the junction of the cheek with the mandible is less than the shortest distance between the eyes on the frons .... 3.
2. Tergite 1 at its base with a distinct, blunt, horn-like protuberance. Punctures of the head in the region of the ocelli ill defined and somewhat crowded together .... *G. rea*, sp. n.
   Tergite 1 at its base without such a protuberance, at the most feebly raised and somewhat shining at that point. Punctures of the head in the region of the ocelli well defined and wide apart.................. *G. nona*, sp. n.
3. Tergite 1 at its base with a distinct, blunt, horn-like protuberance. Mesonotum evenly and somewhat finely rugose .... *G. undina*, sp. n.
   Tergite 1 at its base without such a protuberance, at the most slightly raised at that point. Mesonotum evenly, but somewhat coarsely rugose.......................... 4.
4. When seen from above, the basal margin of tergite 1 is very weakly emarginate and the segment, in consequence, appears narrower in the middle than at the sides. Lamella of the postscutellum more or less triangular . *G. mila*, sp. n.
   When seen from above, the basal margin of tergite 1 is straight or even slightly produced forwards and the segment, in consequence, does not appear narrower in the middle than at the sides. Lamella of the postscutellum evenly semicircular .... *G. incerta*, sp. n.

Males.

1. Eyes bare. Posterior surface of the mesonotum, at least in part, with a conspicuous striate-reticulate sculpture, which contrasts sharply with the anterior mesonotal sculpture .... *G. nona*, sp. n.
   Eyes with short, sparse, sometimes hardly visible hairs. Mesonotum posteriorly at the most with a reticulate sculpture which does not contrast sharply with the anterior mesonotal sculpture......................... 2.
2. Tergite 1 with a conspicuous, deep, pit-like impression on each side at its base......... *G. rea*, sp. n.
   Tergite 1 without pit-like impressions on each side at its base .... 3.
3. When seen from above, the basal margin of tergite 1 is very weakly emarginate and the

segment in consequence appears narrower in the middle than at the sides. Lamella of the postscutellum more or less triangular . *G. mila*, sp. n.

When seen from above, the basal margin of tergite 1 is straight or even slightly produced forwards, and the segment in consequence does not appear narrower in the middle than at the sides. Lamella of the postscutellum evenly semicircular . . . . 4.

4. Mesonotum evenly and somewhat finely rugose . . . . *G. undina*, sp. n.

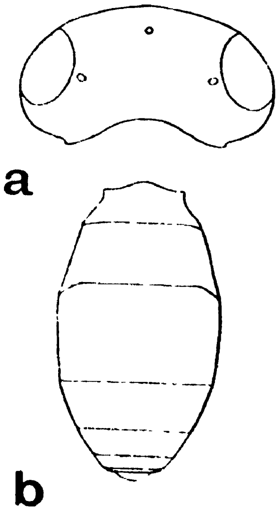
Mesonotum evenly but somewhat coarsely rugose . . . . *G. incerta*, sp. n.

The wide intermandibular space is a much more striking feature of the females than of the males.

Govinda nona, sp. n. (Text-fig. 8.)

♀.—Black, but not deep black. Scape, the first few segments of the funicle, the mandibles, and the legs more or less the same colour, reddish- or yellowish-brown.

Text-fig. 8.



Govinda nona, sp. n.

a, head, ♀, from above ; *b*, abdomen, ♂.

The whole insect appears strongly shining and more or less glabrous ; whatever hairs there are, are inconspicuous.

Head strongly transverse, about twice as wide as long, and conspicuously emarginate behind. Except immediately above the antennal insertions, where the surface is smooth and impunctate, the frons and also the vertex is evenly, but not closely punctured; the punctures are small, the intervals between them several times greater than their own diameter; further, these intervals are shining and smooth, except for an extremely fine scaly-reticulate surface-sculpture, which varies in intensity, on some specimens being hardly visible; on the posterior, declivous part of the vertex, the punctures fade out, the surface there being more or less smooth. Cheeks delicately striated. Eyes moderately large, quite bare. Ocelli inconspicuous, the posterior pair touching the eye-margin. Antennæ short and small, without conspicuous upstanding hairs; scape considerably shorter than the length of the eye; segment 1 of the funicle hardly longer than wide; 3 and 4 very small, transverse; the first four segments are equal to not much more than half the length of the scape; club not very thick, but little thicker than the scape. Mandibles with three teeth, the middle one very small.

Thorax: Mesonotum transverse, its sculpture peculiar; on its anterior surface, it has moderately large, shallow punctures; these punctures are larger than those of the head, they are by no means close together, and the spaces between them show a distinct scaly-reticulate surface-sculpture, which is more intensified than that of the head; the mesonotum, in consequence, appears anteriorly duller and less polished than the head; on the posterior half or third, the surface is somewhat coarsely striate-reticulate longitudinally; frequently this sculpture is reduced in such a way that the smoother sculpture of the anterior part of the mesonotum extends medially backwards to as far as the scutellum, limiting the striate-reticulate sculpture to a small area on each side just where the parapsidal furrows would meet the scutellum if these were present. Scutellum with a fine surface-sculpture and a few small, scattered punctures. Lamelliform process of the postscutellum subtriangular, coarsely longitudinally or reticulately rugose all over; it is about two-thirds as long as the scutellum, about as long as wide basally, and, when seen from above, extends over the propodeum and overlaps the base of the abdomen.

Propodeum perpendicular, with its entire posterior surface more or less depressed and shining and limited by a ridge. Fore wings (see Pl. XI. fig. *h*) brownish, nearly hyaline on their basal third, reaching to nearly the apex of tergite 4 and considerably narrower than the abdomen ; venation sometimes very indistinct ; subcostalis well separated from the edge of the wing, devoid of conspicuous bristle-like hairs ; marginalis more or less punctiform ; stigmalis somewhat short ; postmarginalis variable in length, sometimes a little shorter than the stigmalis, sometimes as long as, or a little longer than, this, but not being strongly chitinised and tending to fade out apically, its limits are never clearly definable. Legs with segment 1 of the hind tarsus a little shorter than the following segments together.

Abdomen rather more than twice as long as the mesonotum and the scutellum together. Tergite 1 strongly transverse ; when viewed from the side it is seen to be strongly raised at its base, but hardly produced backwards, though, owing to the shortness of the propodeum, the mid-point of the posterior margin of the segment almost touches the basal margin of the postscutellum beneath the postscutellar lamella ; on each side of this tergite, at its base, there is a shallow, somewhat shining impression ; between these impressions, at the extreme base of the segment, the surface tends to become smooth and shining, suggesting the presence of a slight horn, but if the segment is seen from the side there is no indication of a clearly rounded protuberance ; tergite 1, further, is irregularly striated, the surface between the striations distinctly sculptured ; 2 strongly transverse, a little longer than 1 ; 3 about twice as long as 2, shining, but not polished owing to a surface-sculpture over the greater, medial, part of it ; at the sides this tergite is delicately and unevenly striated, but the amount of striation is variable ; 4, 5, and 6 together shorter than 3 ; 6 very short and strongly transverse.

Length 2 mm.

♂ differs from the female only in the following respects:—

Head: Antennæ : scape brownish yellow on its basal half, almost as long as the following three segments together ; pedicel very short, half as long as segment 1 of the funicle ; funicle thick, somewhat shining ; segments 1–9 about one and a half to one and three-quarters times as long as wide, clothed with very short, somewhat coarse, dark hairs ; these hairs are semi-erect and most of them are curved ; there are no adpressed hairs present.

Thorax: Mesonotum often duller than in the female by reason of the scaly-reticulate sculpture being intensified ; when this is the case, the punctures become indistinct and tend to fade out ; the punctures are often more numerous in the male than in the female, and the hairs which arise from them are longer. Fore-wings extending to almost the apex of the abdomen, much wider than in the female.

Abdomen : Tergite 1, when viewed from the side, less raised at its base than in the female ; 3 hardly more than one and two-thirds as long as 2.

Length 1·8–2 mm.

Cape Province (Somerset East ; Mossel Bay, *Jan.–July, Oct.–Dec.*), 25 ♀♀, 38 ♂♂. 52 of the total number of specimens are from the latter locality.

A single female from Zululand (Eshowe, *July*) differs from typical females in having the head considerably less transverse (hardly one and two-thirds as wide as long), and less polished, by reason of the surface-sculpture being stronger. The striate-reticulate sculpture of the posterior part of the mesonotum is less strong everywhere, but is, nevertheless, evident. The raised space between the impressions of tergite 1 is more or less smooth and slightly swollen basally ; the segment, in consequence, appears to have a short blunt horn.

This species is characterized by its shining appearance, and especially by its normally, strongly shining head with its scattered punctures, and, further, by the peculiar contrast provided by the sculpture of the front part of the mesonotum and that of its posterior surface.

Govinda rea, sp. n.

This species is closely related to *G. nona*, sp. n., and is closely congeneric with it. The two species have the same facies, and the differences in details of sculpture are gradational.

The differences are as follows :—

♂.—*Head* with its sculpture much less determinate ; a small area just above the antennal insertions is more or less impunctate, elsewhere the frons has an indefinite striate sculpture with small scattered punctures of somewhat irregular shape. The vertex in the region of the ocelli appears dull and finely rugose ; no punctures are visible here ; on its posterior, declivous part, the vertex becomes more shining. Antennæ shorter ; segments 4–9 of the funicle only a little longer than wide ; clothing of the funicle somewhat different ; the hairs are equally short but they are pale and most of them are stiff and bristling. Eyes with extremely short scattered hairs, which are difficult to see.

Thorax : Mesonotum evenly and fairly thickly clothed with short, pale, adpressed hairs. Anteriorly the mesonotum shows an even, but indeterminate sculpture ; there are faint indications of extremely shallow, close punctures ; these punctures appear slanting in such a way that their margin is visible only anteriorly ; in consequence, the mesonotum appears to have, in front, minute, transverse ripples ; on the posterior half or third of the mesonotum. the sculpture becomes much more determinate and there the punctures develop into distinct, but delicate reticulations ; the mesonotum has, further, a very close scaly-reticulate sculpture all over, which renders it somewhat dull. Postscutellar lamella fully two-thirds as long as the scutellum, and considerably wider than long. Fore-wings faintly brownish ; postmarginalis one and a half times as long as the stigmalis ; stigmalis a little longer.

Abdomen : The impressions on each side of tergite 1, at its base, conspicuous and deep, their inner margin very sharply defined.

Length 2 mm.

♀.—Legs brownish yellow.

Head with its sculpture much more determinate than in the male. The greater part of the frons is nearly smooth and is very shining ; towards the ocelli, small, not very clearly defined punctures are present, which become more crowded in the region of the ocelli ; the small intervals between these punctures are finely scaly-reticulate, and there are faint indications of an additional striate sculpture. No hairs are visible on the eyes, but the insect is not in perfect condition.

Thorax : Fore-wings not extending beyond the apex of tergite 4, considerably narrower than in the male.

Abdomen : Tergite 1, seen from the side, strongly raised, distinctly produced backwards and with a distinct horn—that is to say, there is a clearly rounded protuberance present ; seen from above, this horn is short and blunt, and becomes nearly smooth at its apex ; the impressions on each side of the horn are deep as in the male.

Length 1·9 mm.

CAPE PROVINCE (Queenstown, *Jan.* & *Feb.*, 2 ♂♂ ; Ceres, *March*, 1 ♀).

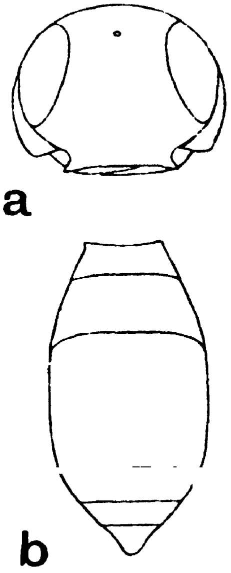
The female here, cannot be definitely associated with the male, but a similar facies, a like type of mesonotal sculpture, and the deep impressions of the basal abdominal tergite seem to provide adequate justification for a provisional association of the two sexes. In the presence of two types of mesonotal sculpture lies a strong resemblance between this species and *G. nona*, sp. n., but in the latter species there are normally large spaces on the front part of the mesonotum, where only the scaly-reticulate sculpture is present, the punctures being wide apart. In *G. rea*, sp. n., there are no such unpunctured areas, the sculpture being as much punctate as scaly-reticulate. The increase of punctures in this species, too, is correlated with its having a denser, more conspicuous clothing of hairs than *G. nona*, sp. n., since each hair springs from a puncture or puncture-like impression.

Gorinda mila, sp. n. (Text-fig 9.)

♂.—Black, the abdomen sometimes brownish-black. Mandibles, legs, and usually the antennal scape brownish-yellow. The head and the thorax of the insect have a dense clothing of short, fine, adpressed hairs, which in some specimens give these parts a distinctly greyish appearance.

Head nearly twice as wide as long, dull above. Frons to the side of, and immediately above, the antennal insertions much less pubescent than the vertex, strongly shining and very finely striated, sometimes with an entirely smooth median space ; sometimes the striations fade out, and the surface shows only a close scaly-reticulate, almost chagrined sculpture. Frons otherwise, the vertex and the temples, dull, very finely rugose, almost chagrined. Antennæ somewhat short ; scape not quite as long as the following three segments together ; funicle shining, clothed with very short, semi-erect, bristling hairs; segment 1 about one and a half times as long as wide; 3 a little longer than 2, but shorter than 1, slightly produced beneath at its apex; other segments, except 12, not, or a little, longer than wide. Eyes rather small, clothed somewhat sparsely with very short, inconspicuous hairs. Cheeks finely but unevenly striated. Distance between the base of the mandibles unusually great, and, in consequence, the side of the head, when this is viewed from in front, appear only weakly rounded; the distance between the blunt angles of the cheeks is considerably longer than the antennal scape or a little longer than the distance between the bases of the eyes; the width of the clypeus between its acutely pointed lateral angles about equal to the length of the antennal scape or a little shorter. Mandibles with two teeth of more or less equal length.

Text-fig. 9.



Govinda mila, sp. n., ♀.
a, head, from in front; *b*, abdomen.

Thorax: Mesonotum about one and a half times as wide as long, dull and appearing evenly and quite strongly rugose; when, however, the mesonotum is viewed from behind, its sculpture is seen to consist of fine close reticulations on a more or less flat surface; the tiny spaces within the reticulations appear slightly shining, and have a fine surface-sculpture. The reticulations are oblique, instead of being perpendicular, to the surface of the mesonotum, so that the true nature of the sculpture is not at first evident. Scutellum with a much finer sculpture than the mesonotum, dull, chagrined, but coarser at the sides. Medial process of the postscutellum triangular or subtriangular; this process is about twice as wide as long and is coarsely sculptured; its length is about one-half to two-thirds that of the scutellum. Propodeum with a transverse, more or less distinct, semicircular carina, which extends between its posterior angles; the surface of the propodeum is more shining than that of the mesonotum, and has longitudinal rugosities or short ridges above and below the transverse carina; when this carina is medially obliterated, the longitudinal ridges are often percurrent over the entire length of the propodeum. Mesopleural impression more or less distinctly, transversely striated. Fore-wings (see Pl. X. fig. *d*) brownish, extending to nearly the apex of the abdomen, rather thickly pubescent, but less so on the basal fourth; venation very distinct; just before its middle the subcostalis takes a gradual, but quite conspicuous, downward curve before reaching the marginalis; marginalis about twice as long as wide or shorter, a good deal shorter than the stigmalis; postmarginalis a little longer than the stigmalis; the angle between the stigmalis and the postmarginalis is hardly more than 30°. Legs with segment 1 of the hind tarsus a little shorter than the following segments together.

Abdomen about twice as long as wide, weakly shining, but sculptured. Tergite 1 strongly transverse; on each side at its base it is neither compressed nor has any trace of an impression; seen from above the segment appears narrower in the middle than at the sides, and its posterior margin is seen to be straight or even slightly emarginate; this segment is not raised at all at its base, and has even, not very close striations over its entire surface; 2 nearly twice as long as 1, with rather weak striations; 3 twice as long as 2, weakly and unevenly striated all over, the surface between the striæ with irregular sculpture; 4–6 together, two-thirds as long as 3, and with a fine, indefinite sculpture; the apex of these segments tends to become smooth and shining.

Length 1·7–2·2 mm.

♀.—Antennæ: scape about as long as the following three segments together; segment 1 of the funicle about one and a half times as long as wide and as long as the pedicel; 2 more or less square in outline; 3 and 4 very small, transverse; 4 smaller than 3; 5–10 forming a club which is about twice as thick as segment 1.

Abdomen: Tergite 1 exactly as in the male; 3 sometimes nearly three times as long as 2; 6 short, transverse, with a slight constriction before its apex.

Length 1·8–2 mm.

In all other respects, the female is like the male.

CAPE PROVINCE (Port St. John, *Mar. & May*; Somerset East, *Oct.–Nov.*, *Jan.*; Mossel Bay, *March*; Transkei, Umtata, *Feb.–Mar.*), 23 ♂♂, 3 ♀♀. NATAL (Kloof, *Sept.*), 1 ♀.

G. mila, sp. n., is usually easily recognizable by the great distance between the bases of the mandibles, the dull appearance of the head and the thorax, the regular, somewhat coarse sculpture of the mesonotum combined with complete absence of parapsidal furrows, and by the triangular process of the postscutellum.

This insect will be discussed further under the two following species:—

Govinda incerta, sp. n.

This insect is extremely like *N. mila*, sp. n., both in facies and in sculpture, and its distinctness from that species is not altogether satisfactory. However, since the two species can be separated by characters which appear to be constant in the small series under examination, it has been considered convenient to keep them apart.

The ♂ differs from that of *mila* as follows:—

Head: The intermandibular space is slightly less great. The striate sculpture of the frons is often very much reduced, the surface there showing only a close scaly-reticulate, almost chagrined sculpture.

Thorax: If the mesonotum is viewed from behind, parapsidal furrows sometimes show in large examples, not as distinct grooves, but as weakly shining, hardly visible, band-like impressions. Postscutellar lamella more or less like that of *mila* in size, but with its posterior margin evenly semicircular. Propodeum: instead of having a single semicircular carina—that is to say, instead of the two ridges which extend inwards from the upper posterior angles of the propodeum meeting in the middle of its dorsal surface as in *mila* and thus forming a semicircular carina—the propodeum of *incerta* has these two ridges extending upwards towards the posterior margin of the postscutellum, where they almost meet just beneath the postscutellar lamella; the lower part of the dorsal surface of the propodeum, though sometimes nearly smooth, more often shows distinct longitudinal rugosities.

Abdomen slightly narrower than that of *mila*; tergite 1 weakly compressed on each side at its base and medially slightly raised at its base; when seen from above, the basal margin of this tergite is always weakly produced forwards towards the propodeum, so that the tergite does not appear narrower at its middle than at its sides.

Length 1·7–2·4 mm.

The female differs from that of *mila* by the same characters as separate the males of the two species, except that the intermandibular space is hardly less great than in *mila*. In the four females which are referred to this species, none of them has any trace of the faint parapsidal furrows which appear in some of the males.

Length 1·8 mm.

CAPE PROVINCE (Somerset East, *Nov.*, *Dec.*, *Jan.*), 8 ♂♂, 3 ♀♀ (Transkei, Umtata, *Feb.–Mar.*), 1 ♀.

Govinda undina, sp. n.

This is a species closely related to both *G. mila* and *G. incerta*, but about its distinctness from either of these the author feels little doubt. The insect shows more affiliation with *incerta* than with *mila*, and could only be confused with that species.

♂.—Legs blackish-brown, the tarsi paler.

Head less transverse than that of *incerta*, about one and a half times as wide as long, its sculpture finer. Intermandibular space less great than in *incerta*, the width of the clypeus between its acute lateral angles being considerably shorter than the length of the antennal scape.

Thorax: Mesonotum appearing finely rugose; when viewed from behind, less distinctly reticulate than in *incerta*—that is to say, the meshes forming the reticulations less raised, the surface being shallowly, closely, but indistinctly punctate; in addition to the punctures, there is a fine surface-sculpture over the whole of the mesonotum. Scutellum much more finely sculptured than the mesonotum, weakly shining in the middle, where the sculpture tends to become reduced; the scutellum, further, is quite strongly flattened. Fore-wings only very faintly brownish. Propodeum with a much more constant type of sculpture than in either of the two preceding species, and in *undina* being quite distinctive; as in *incerta*, two carinæ extend from the posterior angles inwards and upwards, describing an angle, to the anterior margin of the propodeum, but in this species these carinæ become strong ridges separating two raised lateral areas of the propodeum from a medial area, which, modified to receive the raised base of abdominal tergite 1, has the form of an entirely smooth shining excavation; the two lateral areas are sharply contrasted with the median excavation, and their surface is more or less finely rugose.

Abdomen narrower than in *incerta*; tergite 1 compressed basally at its sides and medially at its base strongly raised; the mid-point of its basal margin is produced into a blunt point; in normal attitude of the insect the raised base of the tergite more or less fills the excavation of the propodeum; when viewed from above the basal margin of the segment is seen to project quite strongly forwards towards the propodeum. The sculpture of the abdomen is similar to that of *mila*, but finer; tergite 3 has, in greater part, a fine scaly-reticulate sculpture with weak striations laterally.

Length 1·7 mm.

♀.—Legs paler than in the male, brownish-yellow.

Apart from those differing characters which it shares with the male, the female differs further from that of either of the two preceding species in the sexually modified first tergite. The base of this tergite is strongly elevated and produced into a distinct but blunt horn, which completely fills the excavation of the propodeum; the apex of this horn is more or less smooth and shining.

The wings, too, are slightly longer than in *mila* and *incerta*, extending to nearly the apex of the abdomen.

Length 1·9 mm.

In details of sculpture the female is like the male.

CAPE PROVINCE (Somerset East, *Nov.–Dec.*, *Jan.*, 4 ♂♂, 2 ♀♀; Aliwal North, *Dec.*, 1 ♂).

It should be noted that in *G. incerta* and *G. undina* the upper tooth of the mandibles is often very much longer than the lower one, while in *G. mila* the two teeth tend to be more or less of equal length.

The three preceding species are interesting in that they appear to show different stages in the development of structural modifications of the propodeum induced by corresponding modifications of the first abdominal tergite.

In *G. mila*, a species in which the first tergite is of simple form in both male and female, not being at all raised at its base and thus in normal attitude of the insect, not pressing up against the propodeum, the propodeum has no sharply defined, shining excavation, although its dorsal surface is more or less limited as an area by two ridges or by a single semicircular ridge. Furthermore, the surface within this area is almost as strongly sculptured as that outside it. In *G. undina*, on the other hand, an insect in which the first tergite in the female has a distinct horn and in the male, too, is quite strongly raised, the propodeum is highly specialized in its form, its dorsal surface having a deep, shining, excavation which contrasts sharply with the sculptured lateral areas, and into which the modified base of the first tergite would fit in normal attitude of the insect. *G. incerta* represents an intermediate form; in this species the first tergite is certainly raised at its base, but less conspicuously so than in *undina*, and the propodeum, in consequence, is more specialized than in *mila*, but has not the sharp division into an entirely smooth median area and sculptured lateral areas as in *undina*. The median excavation in *incerta*, though sometimes nearly smooth, more often shows irregular rugosities. Here, since the modification of the first tergite is not of an extreme type, the dorsal surface of the propodeum is necessarily not completely adapted to receive it.

The three preceding species form a natural group, united by a similar type of sculpture. There is no clear gradation between them and the two species *G. nona* and *G. rea*, spp. n., which in themselves form a likewise isolated group.

[To be continued.]

XLVI.—*New Species of Heterocera in the National Museum, Washington.* By W. SCHAUS.

[Concluded from p. 387.]

Thyatiridæ.

Thyatira tama, sp. n.

Female.—Palpi and head drab. Collar pale drab-grey with drab mottling; thorax dorsally fuscous, the tegulæ mottled pale smoke-grey and white, with paired black lines on tegulæ in front, posteriorly with fuscous and cinnamon tips. Abdomen above light drab, underneath whitish buff; tarsi black with white rings. Fore wing: a broad white line outbent from base of costa to median, edged by a black basal line and some brown spots; below cell to vein 1 the white line is finer and forms an almost complete white annulus containing a large brownish-olive spot; below vein 1 the white line is vertical on inner margin. The costa and cell medially are fuscous crossed by black lines; a double antemedial black line slightly outcurved and inbent above inner margin; below cell the medial space is mouse-grey and constricted by the postmedial lines; at middle of inner margin a small light cinnamon-drab spot; postmedial line double, wavy, vertical on costa above discocellular, then well outcurved, very fine, lunular dentate, slightly inbent to inner margin, followed on costa by a large white spot, containing a small light olive-brown spot, from which another double lunular line follows closely the postmedial line; this last double line is filled in with deep mouse-grey; beyond cell and to vein 2 the first and second postmedial lines are followed by white. A triangular fuscous spot on costa beyond the lines, with its apex at vein 6, containing a white costal point; from apex a broad white space, its outer edge wavily inbent to vein 5, and with a slight olive streak on it at costa; at tornus an irregular black line forms an almost oval large spot, inwardly edged with white and containing a brownish-olive curved streak and some pale flesh-colour scaling; the termen medially mottled with drab and white; a terminal lunular black line outwardly edged with white on interspaces; cilia light cinnamon-drab with black hairs at veins. Hind wing light brownish drab on basal half, the veins hair-brown; termen broadly hair-brown, proximally crossed by a pale postmedial line; cilia whitish. Fore wing below ecru-drab, the costa with medial black lines and the postmedial triangular black spot; postmedial black lines on veins. Hind wing below whitish, tinged with pale flesh-colour at base; a faint postmedial line; a broad light drab subterminal shade, its outer edge expanding distally opposite cell.

Expanse 45 mm.

Habitat.—Guasca, Colombia.

Type.—No. 34437, U.S. N. M.

Received from the Rev. Dr. Apollinaire Marie.

Melalophidæ.

Rosema erdæ, sp. n.

Female.—Head, thorax, and fore wing civette-green; palpi and vertex tilleul-buff. Abdomen capucine-buff above, paler underneath. Fore wing: costa narrowly tilleul-buff irrorated with black scales; a round white spot at end of cell and a smaller spot more outset between veins 2 and 3, both with some fuscous irrorations; antemedial white points on veins and a double subterminal series of small white spots. Hind wing cream-colour. Fore wing below pale greenish, with only the discal spot faintly showing.

Expanse 40 mm.

Habitat.—Sta. Catharina, Brazil.

Type.—No. 34359, U.S. N. M.

Collected by F. Hoffman.

A very distinct species.

Notodontidæ.

Marthula agathanzela, sp. n.

Male.—Palpi, frons, and fore legs orange-cinnamon; vertex and thorax warm-sepia; collar and a dorsal spot on thorax mikado-brown; tegulæ light vinaceous-fawn. Abdomen above benzo-brown, darker at base; underneath tilleul-buff; anal tufts medially mikado-brown, laterally vinaceous-fawn. Fore wing above: below cell and vein 3 to termen mostly light greyish-vinaceous, otherwise vinaceous-brown, the apical area cupreous orange-rufous; a pale subbasal line inbent on costa, outset and inbent from median to submedian; medial line outcurved in cell, inbent, double below cell, preceded by mikado-brown shading below cell; a double dark and narrow discal line, united above, open below; postmedial faint, dark, from costa, below vein 5 pale, inbent, inwardly finely dark-edged; a similar parallel line; a fine pale subterminal line distinct throughout, inwardly dark-edged and with diffuse dark shading; all these lines are parallel: a marginal, mostly double series of small black spots; the cupreous space is particularly brilliant along termen from costa to just below vein 4. Hind wing somewhat hyaline, white; some faint terminal dark scaling, expanding along inner margin.

Expanse 34 mm.

Habitat.—Campo Bello, Rio, Brazil.

Type.—Cat. No 34353, U.S. N. M.

Nearest *M. hirsuta* Schaus, but with white hind wings.

Disphragis mahalia, sp. n.

Male.—Palpi fuscous-black. Head, collar, and patagia mottled with long hairs, natal-brown at base, otherwise pallid mouse-grey, the latter colour predominating except at tips of tegulæ; thorax and abdomen above fuscous-black, with natal-brown hairs at base; anal hairs partly mikado-brown. Fore legs with long hairs as on head; hind legs with whitish hairs; abdomen underneath white. Fore wing white, somewhat hyaline, with some scattered dark scales forming an indistinct double postmedial line; base of wing except some pale buff scaling at base of inner margin dusky neutral-grey mottled with black scales, extending from just before antemedial line on costa, its outer edge oblique, to inner margin at tornus; the fine antemedial dark line is slightly outbent and crosses the dark space, being there defined by some whitish scaling; an incurved verona-brown line on discocellular; costa on terminal third like base of wing with some pale points, and below it some cinnamon-buff and fuscous scaling forming a vague triangular shade with its apex at postmedial line. Hind wing thinly scaled, white; cilia at apex fuscous, towards anal angle with some dark scales above and below vein 2; cilia on inner margin pale pinkish buff. Wings below white, thinly scaled; costa of fore wing narrowly suffused with sayal-brown, the dark discal line indicated.

Expanse 38 mm.

Habitat.—Guasca, Colombia.

Type.—Cat. No. 34355, U.S. N. M.

Allied to *D. albovirens* Dognin, differing in more complete white hind wing and the darker basal area of fore wing.

Disphragis poppea, sp. n.

Male.—Palpi black above, the fringe mottled with light cinnamon-drab. Head mottled light cinnamon-drab and whitish. Collar fuscous in front with some white-tipped hairs, posteriorly mottled with benzo-brown. Thorax benzo-brown, the tegulæ mottled cinnamon-drab, black, and whitish. Abdomen above similarly mottled, the anal hairs and abdomen below white. Fore wing from costa medially and obliquely to tornus white with a few cinnamon irrorations; a dark fascia from base of costa and a double similar antemedial line, both outbent to inner margin, which is suffused with sayal-brown and irrorated with black; the antemedial line is followed by two black lunules on costa and points in cell; a double fuscous line from costa through end of cell with brownish mottling between them; a double incurved fuscous line from vein 8, partly on and beyond discocellular, with a whitish line between them; a fuscous shade beyond them to costa before apex; on this shade are traces of a fine, deeply dentate, dark line, followed by a more diffuse lunular subterminal line, partly edged with whitish and followed by small brownish spots; a terminal fuscous lunular line on interspaces, below vein 3 divided into spots; cilia mottled white and hair-brown. Hind wing white; a narrow terminal hair-brown line; cilia white. Wings below white; a fine dark terminal line; cilia white with a few dark hairs.

Expanse 35 mm.

Habitat.—Campo Bello, Brazil.

Type.—Cat. No. 34428, U.S. N. M.

Closely allied to *D. albovirens* Dogn.

Dognina guasca, sp. n.

Male.—Head fuscous mottled with avellaneous. Collar and thorax light pinkish cinnamon, some of the hairs tipped with white. Abdomen above snuff-brown, the anal segment pale pinkish cinnamon. Fore wing: base light pinkish cinnamon edged with white and limited by a curved black line from base of costa to inner margin near base, followed by a constricted snuff-brown space shading to mars-brown on costa, widest on costal and inner margins, outwardly limited by a black line edging a large round space occupying almost the entire outer half of wing; this space forms a perfect circle edged by a white line, distally filled in with pale vinaceous-fawn, proximally with a cinnamon and snuff-brown space and followed on costa by a snuff-brown triangular spot outwardly edged by a subterminal white line which joins the circular white line at vein 5; termen light pinkish fawn preceded by a sayal-brown shade narrowest at inner margin. Hind wing white, the termen and inner margin shaded with cinnamon-buff. Wings below whitish; costa of fore wing broadly suffused with cinnamon-drab and small fuscous points before apex.

Expanse 39 mm.

Habitat.—Guasca, Colombia.

Type.—Cat. No. 34354, U.S. N. M.

Differs from allied species by the complete white circle on outer space.

Eunotela zophara, sp. n.

Male.—Palpi fuscous fringed with army-brown. Head and collar pinkish cinnamon mottled with dark hairs and sepia behind vertex. Thorax pale mouse-grey irrorated with black scales. Abdomen above fuscous, underneath white with fuscous irrorations, the anal hairs cinnamon-buff and white. Fore wing above white, thickly overlaid with dark grey from base to postmedial line, the terminal space paler; traces of an antemedial whitish line, followed in cell by a line of small black spots partly united and some similar fainter spots on submedian fold; medial line white outwardly edged with black, slightly inbent from subcostal to median, then faintly incurved, followed before vein 2 by an oblique black line from median to fold; a thick black line on discocellular inwardly edged with white; postmedial line fine, black outwardly, broadly edged with white from costa to vein 3, this white portion crossed by a broken black line, forming on veins 2–4 alternate black and white points; subterminal line fine, black, well indicated, faintly sinuous; a fine dark terminal line, somewhat lunular. Hind wing white; a faint terminal brownish line; a black spot at anal angle, with a faint black line above it. Fore wing below greyish brown; some white on basal half of inner margin and at costa near apex, also a whitish postmedial line.

Expanse 38 mm.

Habitat.—Campo Bello, Rio, Brazil.

Type.—Cat. No. 34357, U.S. N. M.

Collected by F. Zikan.

Allied to *E. pallida* Schaus.

Procolax pohlana, sp. n.

Male.—Head, collar, and thorax light purple-drab; tegulæ mikado-brown dorsally edged with light purple-drab. Abdomen above fuscous, underneath avellaneous. Fore wing: costa medially drab with some dark scaling, at base with an army-brown line; base from subcostal to vein 1 ochre-red outwardly dark edged, the space beyond cinnamon-brown crossed by two well-separated fuscous lines, outcurved and parallel, not extending on inner margin, which is light drab, not reaching tornus; a mikado-brown shade in cell medially; a silver-white spot at upper angle and a silver S-shaped fine silver line on discocellular; outer space largely light vinaceous-purple, on termen more light vinaceous-lilac; on costa well before apex a large dull Indian-purple spot almost triangular and edged with light vinaceous-lilac; a similar coloured space, broad on inner margin before tornus, extends upward, becoming narrower to vein 4, and is obliquely outbent to a narrow point close before termen;

some irregular diffuse dark shading on termen between veins 2 and 4 ; a fine silver line from costa before apex. Hind wing whitish partly suffused with light cinnamon-drab. Fore wing below suffused with light cinnamon-buff, the veins darker. Hind wing below whitish on disc, the margins pale vinaceous-fawn.

Expanse 68 mm.

Habitat.—Itatiaya, Rio, Brazil.

Type.—Cat. No. 34358, U.S. N. M.

Chliara rovena, sp. n.

Male.—Antenna serrate with long fascicles of cilia, pale vinaceous-buff ; palpi fuscous fringed with pale vinaceous-buff. Head and body pale vinaceous-buff, some black mottling on frons, and a few black irrorations on vertex and collar. Fore tibia clay-colour, the tarsi fuscous with white rings. Fore wing : a fine black line on median vein from near base, extending on vein 4 to postmedial space, the base of veins 2 and 3 also black ; a black spot in middle of cell ; two wavy black lines about discocellular, separated at subcostal, meeting at lower angle of cell ; space below cell to inner margin vinaceous-drab, above median to subcostal pinkish buff, the costa drab ; traces of a double faint cinnamon postmedial line, outcurved, lunular, with a few black scales on veins 5 and 6 within and before the line ; a subterminal black line consisting of a few scales from costa to vein 5, then lunular dentate interrupted by veins ; some black marginal scaling forming rather large spots above and below vein 4 ; cilia and a terminal line above vein 5 mikado-brown. Hind wing somewhat hyaline, light-buff, the veins, termen narrowly, and inner margin broadly ochraceous-buff. Wings below pale pinkish buff.

Expanse 42 mm.

Habitat.—Blumenau, Sta. Catharina.

Type.—Cat. No. 34356, U.S. N. M.

Received from Mr. Bruno Pohl.

Allied to *C. mediostriga* Rothschild.

Hemiceras cabnala, sp. n.

Female.—Head and collar mikado-brown ; a transverse white line between antennæ and on edge of vertex. Thorax mottled with vinaceous-cinnamon and white hairs. Abdomen above drab, underneath pale vinaceous-fawn. Fore wing above sorghum-brown; a curved subbasal line defined by paler edging; a faint darker double medial line, inbent to near submedian, where the two lines meet in a curve and form an annulus below submedian, enclosing some clay-colour scaling; a fine postmedial pale line at 6 mm. from apex, outangled at vein 6 and inbent, straight to inner margin at 4 mm. from tornus; some clay-colour scaling obliquely near middle of outer margin. Hind wing above silky dark fawn-colour. Fore wing below fawn-colour, the costa vinaceous-fawn, the inner margin light vinaceous-fawn. Hind wing below pale vinaceous-fawn, suffused medially on termen with fawn-colour, extending towards cell.

Expanse 42 mm.

Habitat.—Brazil.

Type.—In Cornell University.

Nearest *H. angulinea* Schaus.

Mimallonidæ.

Druentia mutara, sp. n.

Male.—Head and thorax drab-grey. Abdomen pale drab-grey. Wings from base to outer line pale drab-grey with a few scattered dark scales on inner margins; terminal space light drab; cilia light cinnamon-drab faintly tipped with white. Fore wing excurved below the rounded apex, denticulate, especially at tornus; a B-shaped hyaline spot at discocellular inwardly edged by a fine black line; an oblique thick fuscous outer mark on costa to vein 7, then as a fine line, light cinnamon-drab outbent below 7, sharply angled and inbent to near middle of inner margin. Hind wing with termen denticulate, the line almost medial from costa to inner margin below middle; a small discocellular black line. Fore wing below with the outer line interrupted by veins, more vertical, and slightly incurved below vein 3. Hind wing with the line fine, slightly wavy, more vertical from costa, curved below vein 4 and inbent to inner margin; a black discocellular spot.

Expanse 34 mm.

Habitat.—Campo Bello, Province of Rio de Janeiro.

Type.—Cat. No. 34475, U.S. N. M.

The species is closest to *D. muta* Dognin.

Eadmuna paloa, sp. n.

Male.—Body and wings pallid purple-drab irrorated with coarse black scales, less so on terminal third of fore wing, which is also darker shaded on both wings. Fore wing above: a semihyaline white spot at end of cell, edged and divided by a black line, heaviest on outer edge. Hind wing above with faint traces of a broken, wavy, postmedial yellow-ochre line. Wings below with a fine, dark, lunular, postmedial line; cilia dark citrine tipped with white.

Expanse 32 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 34362, U.S. N. M.

This species is near *E. esperanza* Schaus, distinguished by the absence of costal spots.

Eadmuna villaricensis, sp. n.

Female.—Body and wings pale drab-grey irrorated with black scales, the abdomen and wings to postmedial line suffused with light drab; cilia hair-brown tipped with light cinnamon-drab; a fine dark postmedial line, thicker on costa of fore wing, slightly outbent, then gently curved to inner margin, on hind wing almost vertical from costa, then inbent to inner margin. Fore wing: a faint line before middle inbent to inner margin, with a black point on costa, one in cell, and another below cell; traces of a faint outcurved line beyond cell joining the postmedial on inner margin. Wings below suffused with light drab, more thickly irrorated with fine black scales; postmedial line more heavily marked, more evenly outcurved, lunular on hind wing. Fore wing: a whitish shade at apex; a minute dark spot at end of cell.

Expanse 37 mm.

Habitat.—Villarica, Paraguay.

Type.—Cat. No. 34363, U.S. N. M.

Allied to *E. esperanza* Schaus, but distinguished by the distinct postmedial line.

Syssphingidæ.

Citheronia lamata, sp. n.

Male.—Palpi and frons Pompeian-red. Vertex and collar buff-yellow. Thorax madder-brown. Abdomen above: first and third segments light orange-yellow, the second madder-brown, the following segments madder-brown with dorsal buff-yellow spots except on last two segments; laterally the segments are yellow, cut by segmental madder-brown lines, decreasing towards anal segment and reduced to yellow streaks; a broad sublateral brownish-drab line; abdomen below white; fore femora and tibia dark vinaceous-drab, the tarsi yellow. Fore wing mineral-red, the margins suffused with deep vinaceous-grey; a small deep chrome spot at base of cell and faint outbent subterminal line from it to inner margin; an antemedial deep chrome outcurved line across cell, a fainter similar line across submedian fold, and a faint annulus below median vein attached to a short pale orange-yellow streak on inner margin; a postmedial small yellow spot below vein 4; a large maize-yellow irregular patch from vein 6 to apex, with a madder-brown streak across vein 7, and a similar point at costa; from below patch a fine subterminal dentate orange-chrome line. Hind wing mineral-red suffused with dark slate-purple on inner half, the costal half somewhat brighter; a yellow streak along middle of inner margin, preceded by a thick yellow crescent; a subterminal dentate orange-chrome line, more deeply dentate from costa to vein 4, below 4 to inner margin minutely dentate. Fore wing below deep purple-drab; inner margin broadly buff-yellow from base to postmedial line, which is faintly defined, with the small spot below vein 4 white; apex and subterminal line as above. Hind wing below maize-yellow; costal margin, some medial shading from subcostal to vein 6, a broad postmedial band, and termen broadly deep purple-drab; the subterminal yellow line very broad from costa to vein 3, then narrow, terminating in a yellow spot at anal angle; discocellular with a short purple-drab line on either side.

Expanse 98 mm.

Habitat.—Virginia Farm, Guatemala.

Type.—Cat. No. 34460, U.S. N. M.

Allied to *C. collaris* Rothschild, with the yellow markings except the apex much reduced.

Citheronia benjamini, sp. n.

Male.—Antenna russet-vinaceous, the pectinations with light olive-grey tufts. Head rufous, with cream-colour tufts at antenna; collar narrowly rufous in front, followed by a massicot-yellow band edged behind with ferruginous, the posterior edge paler. Thorax rufous, the tegulæ massicot-yellow edged and crossed by rufous lines. Abdomen above russet-vinaceous, the base with a broad transverse whitish band. Fore wing light vinaceous-drab, the costal edge and an antemedial and postmedial shade somewhat darker, the veins finely grenadine-red; the postmedial shade with fuscous streaks on interspaces; a small round cream-colour spot with dark edge at base; a large whitish spot at end of cell, crossed by small and thick deep brownish-drab lunules; beyond cell white points above vein 5, below vein 4, and below vein 3, the last two on the dark postmedial streaks; from vein 6 to costa before apex large massicot-yellow spots, the costal spot reduced to a streak; small subterminal pale spots from apex to vein 4, between 4 and 2 a fine lunular line. Hind wing brownish drab suffused with vinaceous-rufous; base with massicot-yellow hairs forming a large diffuse spot; termen with large cuneiform massicot-yellow spots on interspaces, separated by the reddish veins. Fore wing below: costa narrowly and termen broadly vinaceous-drab; inner margin to postmedial broadly massicot-yellow, also the cell to end; an oblique dragon's-blood-red bar on discocellular, followed by a similar shade to postmedial from vein 2 to costa; markings otherwise as above. Hind wing below massicot-yellow to the postmedial dragon's-blood-red incurved line touching a similarly coloured bar on discocellular; postmedial followed by vinaceous-drab on interspaces, the termen as above.

Expanse 66 mm.

Habitat.—Buenos Ayres.

Type.—Cat. No. 34467, U.S. N. M.

Named in honour of my friend Dr. Marcus Benjamin.

Adelocephala ocarona, sp. n.

Male.—Body drab. Fore wing drab, the space between the two lines pale greyish vinaceous; lines cinnamon-drab, the veins finely drab; antemedial line slightly inbent; the postmedial from costa near apex to before middle of inner margin; discocellular light cinnamon-drab; terminal line benzo-brown. Hind wing light drab, the veins not prominently defined; a dark postmedial line from apex evenly outcurved to inner margin at two-thirds from base. Fore wing below without the antemedial line.

Expanse 62 mm.

Habitat.—Rio de Janeiro.

Type.—Cat. No. 34468, U.S. N. M.

Differs from *A. anthonilis* Herrich-Schäffer by the postmedial line on hind wing, which is curved and closer to termen.

Adelocephala picklei, sp. n.

Male.—Head, collar, and thorax vinaceous-drab. Abdomen above cinnamon, underneath dusky drab. Fore wing deep brownish drab; base brownish drab, limited by a fine, wavy, dark antemedial line; white spots at upper and lower angle of cell; a fine dark lunular line from costa near apex to inner margin before tornus; termen suffused with light vinaceous-drab at apex; from vein 3 to tornus with light cinnamon-drab. Hind wing: costa broadly dark cinnamon-drab; a fine dark lunular line from costa at apex to inner margin above anal angle, termen light vinaceous-drab. Wings below vinaceous-drab, the veins and lines darker.

Expanse 41 mm.

Habitat.—Pernambuco, Brazil.

Type.—Cat. No. 34446, U.S. N. M.

Named after its discoverer, Dr. Benito Pickle.

Conspicuous by the double white spot on fore wing.

Geometridæ.

Certima cletiusaria, sp. n.

Female.—Body and wings deep olive-buff thickly irrorated with wood-brown; the lines pale olive-buff. Fore wing: a nearly vertical antemedial line finely edged outwardly by a black line: a fine black line on discocellular; postmedial line inwardly edged with black, faintly incurved from costa, slightly outcurved between veins 5 and 3, then incurved to inner margin; a faint terminal black line. Hind wing: a dark line on discocellular; postmedial line inwardly dark-edged, vertical from costa to vein 4, rounded and inbent to inner margin ; termen crenulate, with a fine terminal black line. Wings below pale whitish buff with some light cinnamon-drab irrorations ; the lines faint.

Expanse 38 mm.

Habitat.—Tucuman, Argentina.

Type.—Cat. No. 34379, U.S. N. M.

Alcis sanguistellata, sp. n.

Male.—Antenna black. Palpi black, the tip with some grey scales. Frons with lower part fuscous, above and vertex pallid mouse-grey. Thorax and abdomen pallid mouse-grey with some fine black irrorations ; an eugenia-red spot on collar behind and similar lines across tegulæ ; similar markings on metathorax and basal segments of abdomen. Wings pallid mouse-grey, almost whitish, with some black irrorations ; a double postmedial macular line of eugenia-red, the outer portion forming triangular spots on veins ; a single subterminal line of rounder spots and larger marginal spots on interspaces all eugenia-red. Fore wing : costa darker with diffuse darker black spots and striæ ; subbasal and antemedial eugenia-red spots on veins partly extending on veins ; a black point on discocellular ; black spots on costa towards apex ; cilia with terminal fuscous spots. Hind wing : traces of eugenia-red medial spots. Wings below pale tilleul-buff, the fore wing with fine olive-buff striæ and black striæ on costa, also a black discal spot and faint postmedial points ; the hind wing with few striæ, a black discal spot and distinct black postmedial points on veins.

Expanse 33 mm.

Habitat.—Aracatuba, São Paulo, Brazil.

Type.—Cat. No. 34364, U.S. N. M.

I am indebted to my friend Mr. Pohl for this charming species.

Polypœtes ineldo, sp. n.

Male.—Head and thorax blackish mouse-grey, the frons partly circled with light buff ; some white hairs on tegulæ. Abdomen above dark mouse-grey ; small sublateral white spots ; venter mouse-grey. Fore wing thinly scaled, dark mouse-grey, the veins light buff, the other markings white ; a streak below cell at base ; an irregular antemedial spot in cell ; a broad spot more outward below cell from median to vein 1; a postmedial spot from subcostal to stalk of veins 3 and 4, narrow at costal margin, its outer edge incurved, then expanding; a subterminal dentate line cut by veins. Hind wing semihyaline-white, the costa narrowly, the outer and inner margins broadly, blackish mouse-grey. Fore wing below similar, the veins only on termen light buff. Hind wing below as above.

Expanse 34 mm.

Habitat.—Guasca, Colombia.

Type.—Cat. No. 34378, U.S. N. M.

PYRAUSTINÆ.

Pycnarmon juanalis, sp. n.

Female.—Palpi: first and third joint black, the second white. Head and collar white, the latter with a black line in front and subdorsal black points behind. Thorax and abdomen white above, the abdomen below yellow with some lateral black points. Fore wing white; a black point at base of costa and a diffuse streak below subcostal; a subbasal black spot on inner margin and some black mottling above it; an antemedial black line from costa to median and inbent black, scaling at inner margin; cell medially and below to vein 1, also beyond cell to postmedial line, suffused with shell-pink and ochraceous-salmon, iridescent; a similar more golden streak below vein 2 from cell to postmedial line; paired black lines on costa above the broad black spot at discocellular, and on costa before postmedial; veins beyond cell to postmedial irrorated with black; postmedial line fine, sinuous, broken below vein 8 into isolated black scales, denser and expanding between veins 4 and 2, obsolescent but present and inset from submedian fold to inner margin; a black spot at apex and traces of faint brownish terminal spots. Hind wing: base and medial space as on fore wing; a thick black spot on discocellular; an interrupted postmedial diffuse black line on costa, from vein 4 to vein 2, and on inner margin, where it is more medial. Both wings show in transparence the marginal spots of underside. Wings below white. Fore wing: a long black streak on costal edge from base to antemedial; medial and postmedial lines on costa fainter; discal spot smaller; large subterminal fuscous spots from costa to below vein 6 and marginal spots below vein 4 and vein 2. Hind wing with three large, round, fuscous marginal spots.

Expanse 13 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 34429, U.S. N. M.

Cybalomia govinalis, sp. n.

Male.—Palpi cinnamon above, white below. Head and collar orange-cinnamon. Thorax light pinkish cinnamon. Abdomen above and below pinkish buff. Thorax below white; fore femora light pinkish cinnamon, the tibia pinkish cinnamon, the tarsi white. Fore wing light orange-yellow; costal edge white; the veins and lines capucine-orange; a well outbent sinuous antemedial line crossed below vein 1 by an inbent line; a faint dentate line on discocellular; postmedial line outcurved from vein 8, incurved below vein 3, faintly dentate on veins; a very fine and faint terminal line; cilia pale orange-yellow at base, the tips broadly white. Hind wing semihyaline-white, the veins pale orange-yellow; terminal line orange-buff; cilia as on fore wing. Fore wing below as above but much paler.

Expanse 30 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 34433, U.S. N. M.

Psara grisealis, sp. n.

Female.—Palpi hair-brown above, white below. Head, body, and wings deep olive-buff, suffused with light drab. Body below and legs white. Fore wing: lines fine, hair-brown; a faint antemedial line, slightly outcurved at costa, then vertical; a fuscous point in middle of cell and a fine line on discocellular; postmedial line outbent from costa, outcurved and dentate from vein 5 to vein 2, retracted to lower angle of cell and downbent to inner margin; a fuscous terminal line; cilia buff-white, crossed by a dark line near base. Hind wing: a fine fuscous streak on discocellular; postmedial line lunular, outcurved, upturned below vein 2 and inbent to middle of inner margin; a terminal narrow hair-brown shade; cilia as on fore wing. Fore wing below paler, the inner margin white, the lines as above. Hind wing below whitish, the termen with light brownish suffusions; the lines as above.

Expanse 25 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 34431, U.S. N. M.

Bœotarcha fieldialis, sp. n.

Male.—Palpi light vinaceous-cinnamon, underneath at base white. Head and thorax cinnamon-buff. Abdomen above: first segment buff-white, the following segments drab with white segmental lines, the anal segment pinkish buff; underneath and legs whitish. Fore wing: basal third buff-yellow, the veins and inner margin with some ochraceous-orange scaling, the costa vinaceous-brown; medial space deep livid brown, the proximal edge vertical, the distal edge dentate, extending well towards termen; costa yellowish medially and with a triangular yellow spot before apex; a postmedial series of small yellow spots in the dentate edging of the dark space; a dark brownish vinaceous streak to apex; termen buff-yellow, the veins finely rufous; terminal cinnamon spots on interspaces; cilia whitish. Hind wing semihyaline suffused with golden-white; terminal small cinnamon spots preceded by pale yellowish suffusions. Fore wing below with the markings duller, the yellow portions whiter. Hind wing below more faintly marked.

Expanse 20 mm.

Habitat.—Castro, Paraná.

Type.—Cat. No. 34432, U. S. N. M.

Hapalia suralis, sp. n.

Female.—Palpi cinnamon above, buff-white below. Head, collar, and tegulæ clay-colour; abdomen above and below vinaceous-buff. Fore wing cinnamon, more of a pinkish cinnamon at base and terminally; spots white edged with mikado-brown; an antemedial spot below cell between a double dark vertical line; a spot at end of cell and a much larger spot below vein 2 near cell; a fine fuscous postmedial line, preceded by small hyaline spots, the largest above vein 5, and a second spot above vein 2, followed by faint yellowish macular edging and dark shading on interspaces; a terminal fine snuff-brown line; cilia whitish. Hind wing semi-hyaline white; a fine dark postmedial line, somewhat punctiform, retracted at vein 2; termen cinnamon-buff, inwardly edged by a dentate brownish shade, outwardly by the terminal mikado-brown line; cilia white divided by dark shading. Fore wing below light pinkish cinnamon, the markings as above. Hind wing below with a double line at discocellular; postmedial line better marked; the terminal markings paler and suffusing somewhat; costa with light pinkish-cinnamon suffusions.

Expanse 32 mm.

Habitat.—São Paulo, Brazil.

Type.—Cat. No. 34430, U.S. N. M.

SCHŒNOBIINÆ.

Dismidila vivashæ, sp. n.

Female.—Palpi outwardly fuscous-black, internally white. Body above blackish violet-grey, the base of abdomen dorsally with a pinkish-cinnamon transverse line; body below and legs white. Fore wing quaker-drab; the base narrowly darker; antemedial line outangled on costa, indentate below subcostal, then sinuous to inner margin, followed below cell by an ochraceous orange line and a black vertical line; costal edge at base with a small ochraceous-orange spot; a large hyaline medial space in cell containing a black annulus, on one wing filled in with cinnamon; the costa medially white with ochraceous-orange mottling along the subcostal; the hyaline space is outcurved and forms a small spot below cell at vein 2; an oval fuscous line at discocellular with some mars-yellow scales; a white point beyond at veins 4 and 5; postmedial line dark quaker-drab, deeply outcurved, sinuous and dentate, outwardly edged with light quaker-drab and then by another dark line; a postmedial white spot on costa and some whitish at apex; some white on termen below projection at vein 4; cilia white at excisions, with a black spot at vein 7 and black between veins 4 and 3. Hind wing quaker-drab; a broad postmedial dark quaker-drab line and a narrower subterminal line; a terminal benzo-brown line partly mottled with raw-sienna; cilia whitish at excisions and with black spots at projections. Fore wing below white on basal half, with dark shading at base of costa and median vein; a small dark annulus in middle of cell; a sinuous, dark, vertical, postmedial line; outer space dull quaker-drab irrorated with white towards inner margin; cilia about the same as above. Hind wing below white; a dark discal spot at middle of discocellular and another at lower angle; a very irregular postmedial line; outer half tinged with gull-grey; cilia as above.

Expanse 26 mm.

Habitat.—Cañon del Tobina, Colombia.

Type.—Cat. No. 34423, U.S. N. M.

Cacographis colombiana, sp. n.

Male.—Palpi buff above, white in front. Head, collar, and thorax white with a few brownish scales. Abdomen white, with pale orange-yellow transverse bands finely edged with black dorsally and underneath, also a few scattered black scales; legs white, the fore tibia inwardly fuscous. Wings light orange-yellow. Fore wing: base white, with fuscous lines and a small light orange-yellow spot; antemedial with white mottling below cell; medial white spots on costa, in cell, below cell, and on inner margin partly edged with dark brown scales; a similar white lunule on discocellular; a postmedial white line, partly macular, diffusely edged with hair-brown, downcurved from costa, inset at vein 3 and inbent to inner margin; a marginal series of white spots finely dark-edged on interspaces; cilia suffused with cinnamon-brown in certain lights. Hind wing: a subbasal and an antemedial white line; a sinuous postmedial series of white spots partly edged with buffy brown; the marginal white spots more oval, the outer line edging them continuous, somewhat lunular. Wings below white with a broken medial hair-brown line; the postmedial white spots defined by the hair-brown edging which forms lines; terminal space pale orange-yellow, the marginal spots as above.

Expanse, male 28 mm., female 33 mm.

Habitat.—Colombia.

Type.—Cat. No. 34409, U.S. N. M.

XLVII.—*Synonyms in the Order Trichoptera.*

By Martin E. Mosely, F.R.E.S.

McLachlan, in his ' Monograph and Revisional Synopsis,' detailed what were considered in his time to be the characters on which genera in the Trichoptera should be separated. Of these characters he gives, as the most important, the number of tibial spurs and the neuration, placing the arrangement of the spurs first, but adding that this character " is often eminently artificial."

Since his day there has been a vast increase in the number of known species, an increase mainly due to the efforts of Ulmer, Banks, Martynov, Navás, and others.

With a greater knowledge of exotic species ideas have necessarily somewhat changed as to what constitutes a generic character. It has become evident that if the rule as to the spurs were to be strictly observed, the number of genera would be enormously increased, and in many cases unnecessarily, as the arrangement of the spurs is often in no way co-related to differences in the general form of neuration, palpi, and genitalia. Even McLachlan hesitated when confronted with the anomaly in the spurs of *Drusus annulatus*, in which examples have been found with the ♂ spurs 0 . 3 . 3 and 1 . 3 . 3 existing side by side. Nevertheless, his faith in the existing rule did not permit him definitely to sink his genus *Peltostomis*, erected to take the examples with the 1 . 3 . 3 spur formula. It was left to Ulmer, in the ' Genera Insectorum,' 1907, to give the *coup de grâce* to this doubtful genus.

There are other genera which may well follow *Peltostomis* into obscurity with a view to the simplification of the classification.

In two of these, *Stasiasmus* and *Catadice*, the species are so clearly related to those of *Drusus* as to leave little doubt that to keep them in separate genera is unnecessary.

Stasiasmus was erected to take the species *rectus*, originally placed in *Drusus*, but separated later by McLachlan owing to the spurs being 0 . 2 . 3 in the ♂, instead of 0 . 3 . 3, as is usual in this genus.

In my collection, I have examples of this species with the varying spur-formula 0 . 2 . 2, 1 . 2 . 3, and 1 . 3 . 3, though the majority have the formula 0 . 2 . 3. It is therefore evident that the arrangement of spurs is unstable.

Despax, in his account of the larva, has been unable to find any material difference from the *Drusus* form.

I may add that neuration and genitalia conform to the general arrangement in *Drusus*, though in some examples from Le Lioran in the ♂ the pencil of hairs that usually occupies the pouch of the posterior wings is missing.

In the circumstances I propose to transfer *rectus* back to *Drusus*, its original genus, and to sink *Stasiasmus*, the synonymy being :—

Drusus Steph. Illustr. Brit. Ent. p. 231 (1837).

Syn. nov. *Stasiasmus* McLach. Rev. & Syn. Trich., Suppl. pt. 2, p. 42 (1880) ; Ulmer, Gen. Insect. fasc 60 *a*, p. 66 (1907) ; Despax, Bull. Soc. Hist. Nat. Toulouse, lvi. pp. 199–205 (1927).

The single species *S. rectus* being once more known as *Drusus rectus* McLach.

Let us now consider *Catadice*. This genus was erected to take a Spanish species *bolivari*, in which the spurs are 1 . 2 . 3 in both sexes, and which has a pouch but no pencil of hairs in the posterior wing of the ♂. In the original description McLachlan stated that the pouch also was wanting, but in the First Additional Supplement the error is rectified. In other respects, *i. e.*, neuration and genitalia, the species conforms with *Drusus*.

If we agree, and I think all Trichopterists are now agreed, that the spurs are not of supreme generic importance, we have only to consider the value of the absence of the pencil of hairs. As stated above, I have in my collection examples of *D. rectus*, from Le Lioran in the Auvergne region of France, which are indistinguishable as to spurs, neuration, and genitalia from the Pyrenean form, but here, also, the pencil of hairs is lacking. Both Dr. Ulmer and the late Dr. Ris, to whom I submitted examples, considered that the form is undoubtedly *rectus*. If, therefore, there is no justification for erecting a distinct genus for this Auvergne insect, there can also be no sound reason for retaining *Catadice* as a separate genus, and I propose to sink it, the synonymy being :—

Drusus Steph. Ill. Brit. Ent. p. 231 (1837).

Syn. nov. *Catadice* McLach. Rev. & Syn. Trich., Suppl. pt. 2, p. 40 (1880); Ulmer, Gen. Insect. fasc. 60*a*, p. 66 (1907); Klapálek, Termes. Fuzet. v. 21, p. 488 (1898), v. 22, p. 432, pl. xviii. figs. 6–10 (1899).

The species in *Catadice* being known in future as

Drusus bolivari McLach.
—— *estrellensis* McLach.
—— *tenella* Klap.

Another genus to disappear is McLachlan's *Nesopsyche*. The genotype, *N. flavisignata* McLach., is in the British Museum collection, and, as suggested by Ulmer in the 'Genera Insectorum,' it is a ♂ *Dipseudopsis*, and not a ♀ as stated by McLachlan. The synonymy will be therefore :—

Dipseudopsis Walker, Cat. Neur. Br. Mus. p. 91 (1852).

Syn. nov. *Nesopsyche* McLach. Trans. Ent. Soc. Lond. (3) vol. v. p. 268 (1866) ; Ulmer, Gen. Insect. fasc 60 *a*, p. 188 (1907).

The single species in *Nesopsyche* being known in future as *Dipseudopsis flavisignata* McLach.

The type is now in very bad condition, wings broken and body covered densely with mould. I will therefore repeat McLachlan's original description of the general appearance, adding particulars of the specialized spur of the posterior leg and the genitalia. The abdomen has now been cleared in KOH and mounted in Canada balsam.

McLachlan writes of it as follows :—

" Antennæ blackish-fuscous, the basal joint yellow. Head black, yellow between the antennæ. Maxillary palpi black. Labial palpi yellow. Mesothorax and abdomen black. Anterior wings dark fuscous with large yellow spots, of which a triangular one on the dorsal margin with a prolongation towards the base is the most conspicuous ; in the apex there is a large almost circular whitish spot, enclosing a large pupil of the ground-colour. Posterior wings fuscous, slightly and narrowly yellowish about the middle of the costal margin and with an indistinct whitish cloud in the apex. Legs with all the coxæ blackish-fuscous; anterior femora testaceous at the tips; intermediate and posterior femora testaceous, fuscous at the base; posterior tibiæ wholly fuscous with all the tarsi testaceous.

Fig. 1.

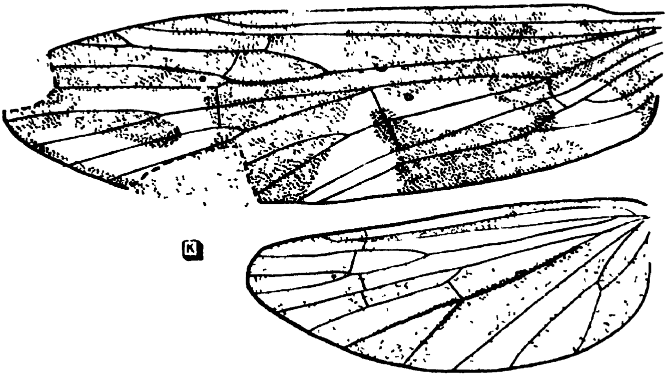
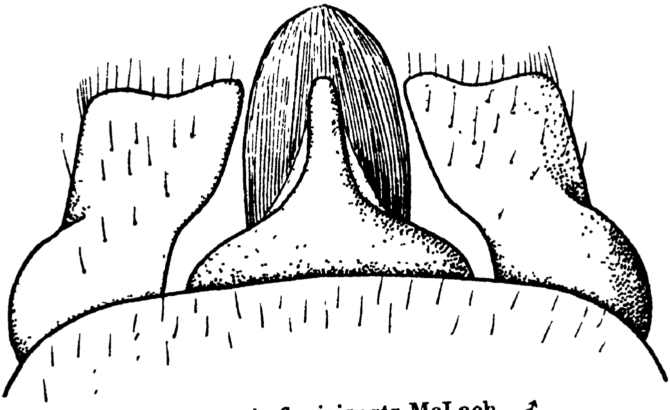


Fig. 2.



Dipseudopsis flavisignata McLach., ♂.

Fig. 1.—Wings.
Fig. 2.—Genitalia from above.

"Length of body 4½ lin.; exp. alar 11 lin."

To this description I will add:—

The specialized spur of the posterior leg very long, nearly as long as the first tarsal joint; towards the dilated base is a very short, narrow, pointed branch (not

Fig. 3.

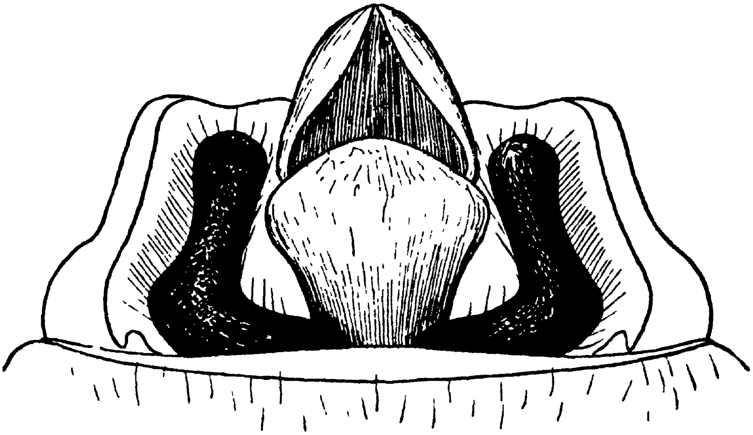


Fig. 4.

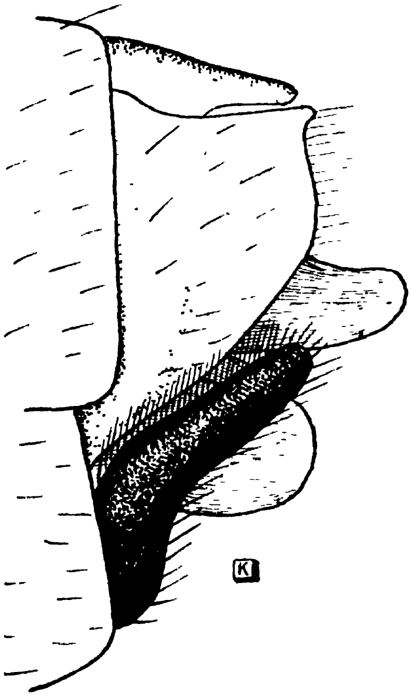
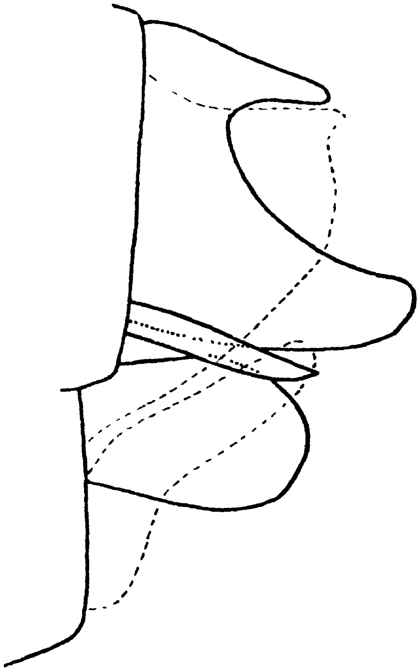


Fig. 5.



Dipseudopsis flavisignata McLach., ♂.

Fig. 3.—Genitalia from beneath.
Fig. 4.—Genitalia from the side.
Fig. 5.—Genitalia, showing internal appendages.

curling round the spur as in *voluta*); midway the long spur is slightly twisted. In the basal pair of spurs of the posterior leg the inner is very much reduced.

Genitalia (♂).—From above, the margin of the terminal dorsal segment straight; beneath it, at the centre, proceeds a dorsal process, broad at the base, abruptly narrowing to a finger-like extension of the centre; this process is attached at the base to an upper penis-cover, which from above appears as a large oval mass beneath the extended centre; from the side, between the dorsal process and the penis-cover is a wide rounded excision. Superior appendages very broad, from above, sinuous, with truncate apices; from the side, with rather a convex outer margin; at the extreme base of each, seen from beneath, is a small angular process arising on the lower margin. The penis from the side is round and fleshy, and there are two narrow blade-like penis-sheaths, but no lower penis-cover. Inferior appendages very black, rather heavily fringed, particularly on the upper margin; from the side narrow and slightly curved; from beneath broad at the base and strongly geniculate.

Fig. 6.

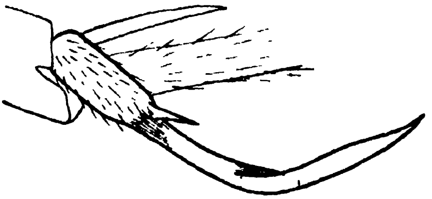
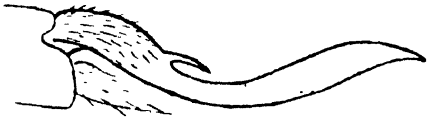


Fig. 7.



Dipseudopsis flavisignata McLach., ♂.

Fig. 6.—Modified spur of posterior leg, internally.
Fig. 7.—Modified spur of posterior leg, externally.

Type (♂) in the British Museum collection; wings mounted dry, the remainder in balsam.

Macassar, Celebes (*Wallace*).

I will take this opportunity of calling attention to a few of the more recent cases of specific synonymy.

On a visit to the Paris Museum a few years ago, I noticed a *Setodes* labelled "*S. galaica* Navás." A close examination of the type showed that it was *S. lusitanica* McLach.

The synonymy will therefore be :—

Setodes lusitanica McLach. Rev. & Syn. Trich., First Add. Suppl. p. 40 (1884).

Syn. nov. *Setodes galaica* Navás, Broteria, Series Zool. xxi. fasc. 3, pp. 145–6 (1924).

In the British Museum are examples, ♂ and ♀, of *Beræa valirana* Navás from Andorra, kindly presented by Father Navás. An examination of this species has shown that it is in fact *Micrasema minimum* McLach., and this is confirmed by the figure of the posterior wing that accompanies the description.

The synonymy will therefore be :—

Micrasema minimum McLach. Rev. & Syn. Trich. p. 264 (1876).

Syn. nov. *Beræa valirana* Navás, Rev. Acc. Madrid, xv. p. 749 (1917).

In the same number of the journal is a description with figures of a *Grammotaulius basilica* Navás. Señor Bolivar recently sent me examples of this species from Cercedilla, Spain, and I find that they are in fact *Limnophilus submaculatus* Rambur, which is confirmed by the figures and description of the species.

The synonymy will therefore be :—

Limnophilus submaculatus Rambur, Neur. p. 474 (1842).

Syn. nov. *Grammotaulius basilica* Navás, Rev. Acc. Madrid, xv. p. 745 (1917).

In the 'Revista Broteria,' Series Zool. xxiii. fasc. 3, pp. 112–113, fig. 21 (1926), Navás describes a variety of *Plectrocnemia conspersa* Curt. under the name *indiga,* mentioning that there are a ♂ and ♀ in the Paris Museum both from Isère. At my request Monsieur Berland kindly sent me the pair for examination, and I find that while the male is an obvious monstrosity as regards neuration, on which the variety was founded, the ♀ is a normal *conspersa,* and is labelled as such by Navás himself. I might mention that the genitalia is normal in both sexes.

I therefore sink the variety, the synonymy being :—

Plectrocnemia conspersa Curt. Phil. Mag. p. 213 (1834).

Syn. nov. *Plectrocnemia conspersa* var. *indiga* Navás, Brot. Ser. Zool. xxiii. fasc 3, pp. 112–113 (1926).

XLVIII.—*Precocious Reproduction in the Sponge*, Dictyoclathria beanii (*Bowerbank*). By M. Burton, M.Sc., British Museum (Natural History).

We have, as yet, no information as to the period occupied by the development of the sponge-embryo, and it would be difficult to obtain such information by direct observation. Certain specimens recently examined offer, however, a possibility of estimating within certain limits the length of this period for at least one species, and, moreover, afford data concerning the earliest time at which a sponge may become reproductively active. It is not possible to speak of a time of sexual maturity, since the embryos about to be described are probably of asexual origin * (*cf.* Wilson, 1894).

The specimens on which the following observations are based belong to *Dictyoclathria beanii* (Bowerbank), and before proceeding with the account of them it will be necessary to outline the history of the species, which was originally described from an encrusting sponge from the British coast and named by Bowerbank (1866, p. 334) *Isodictya beanii.* The spicules in the holotype are styli, slightly subtylostylote, small acanthostyli, dermal subtylostyli, toxa, and palmate isochelæ. The styli and acanthostyli form a reticulation, the former being found in the ascending fibres and projecting from the surface, the latter sometimes entering into the formation of the ascending fibres, but forming mainly the horizontal connectives between the fibres. Six years later Schmidt (1868, p. 9) described, as *Clathria morisca,* an erect, branching, and subflabellate sponge from Algeria, having the same type of skeleton as *Isodictya beanii.* Nothing more was known of the species until Swartschewsky (1905, p. 52) described, under *Raspailia incrustans,* a thinly-encrusting sponge from the Black Sea having the same spicules as *Isodictya beanii,* but in which both the styli and acanthostyli were disposed in a single layer, with their bases planted on the substratum, and the styli were incipiently tuberculate at the base. Later, Babić (1921, p. 11, and 1922, pp. 258–261) described several sponges, having spicules similar to those of *Isodictya beanii* Bowerbank, under *Artemisina mediterranea* and

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* For this reason I have refrained from the use of the terms neoteny or pædogenesis.

A. paradoxa, some of which were encrusting, others erect and branching, with flattened branches, the largest being nearly 6 cm. high. Topsent (1920, p. 18) re-described the type of *Clathria morisca* Schmidt, referring the species to a new genus, *Dictyoclathria*, and later (1925, p. 660) recorded it from Naples, having found an encrusting specimen and a branching specimen (collected on October 7), with thin (? cylindrical) branches, containing numerous embryos in an advanced stage of development. In the last-named paper, Topsent established the identity of *Scopalina toxotes* Schmidt *, *Artemisina mediterranea* Babić, and *A. paradoxa* Babić, with *Clathria morisca* Schmidt.

On p. 651 of the same work, Topsent described, as *Clathria gradalis*, a form which appears to agree in most respects with *Raspailia incrustans* Swartschewsky. In the several encrusting specimens described, the skeleton varies from that described for *Raspailia incrustans*, with a single layer of megascleres, styli, and acanthostyli echinating the substratum, to a condition in which this uniformity is broken by the development of columns of spongin in which the megascleres have their bases embedded as in a typical *Microciona*.

In a collection entrusted to me for identification by Dr. H. Srinivasa Rao, of the Indian Museum, collected by him at Naples in February 1930, there are three specimens which are of interest at this point. The first I had provisionally named *Clathria gradalis* Topsent, the second *Dictyoclathria beanii* (Bowerbank). Both are thinly encrusting and contain exactly similar embryos, which agree with the description given by Topsent (1925) of the embryos in his mature branching specimen. This led me to compare Topsent's and Bowerbank's species, both of which are remarkably alike in spiculation, and as a consequence I have no doubt as to the identity of the two. Moreover, in the preparation from the type of *Clathria morisca* Schmidt, in the British Museum, there are several embryos, and these, too, agree with those described by Topsent and with those present in Dr. Srinivasa Rao's specimens. Dr. Rao's third specimen is encrusting, with a single erect digitate process at the centre, obviously representing the first stages in the growth of the erect form, so that, with the specimens described by other authors, there is here a tolerably complete series of growth-forms of *Dictyoclathria beanii* (Bowerbank), and it is of interest to note that the phases through which the skeleton passes in the course of growth correspond to the conditions typical of *Hymedesmia*, *Microciona*, possibly *Clathria*, and *Dictyoclathria*, a disquieting fact suggesting the need for some revision of our ideas concerning the diagnostic features of these genera. The size to which the sponge will grow is indicated by the types of *Myxilla banyulensis* Topsent (1892, p. xxii), which species is also identical with *Isodictya beanii*. The largest of these is erect, with cylindrical or flattened branches, and attains a height of 15 cm. by a breadth of 12 cm.

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* In this paper Topsent regards *Scopalina toxotes* as a synonym of *Clathria morisca*, as a result of having examined " une éponge rameuse de la collection [at Strasbourg], etiquetée ' *Scopalina toxotes* O. Schm. Neapel. O. Schmidt 1877 ! ' " This, however, is incorrect, as the original description of the species deals with " ziegelrothe Krusten " from Zara. A preparation, labelled in Schmidt's handwriting " Scopalina toxotes Sdt., 1868. Dalmatia," in the British Museum shows the species to be, as Babić (1922, p. 261) has suggested, a synonym of *Microciona armata* Bowerbank.

The main interest of Dr. Srinivasa Rao's specimen is, however, in the light they throw on the time required for the development of the embryo. They also afford examples of precocious development. In neither of them is there any sign of oscules or pores, nor any trace of canals. Whether flagellated chambers have developed is uncertain. None could be seen in the unstained preparation, but since the point is unimportant, in view of the absence of oscules and pores, and the material available for sectioning is small, no further investigation was made. The skeleton consists of all five of the normal categories of spicules, all the megascleres lying horizontally. Comparing the degree of development of skeleton and canal-system with that of other post-larvæ of which the ages are known (*cf.* Burton, 1933), the two incrustations from Naples cannot be more than a week old, unless growth has been abnormally delayed, and the probability is that they are only some four days old.

The possibility of delayed development in these incrustations cannot be disregarded, but since both specimens have reached approximately the same stage of development in regard to skeleton and canal-system, do not appear to be abnormal or pathological in any way, and, judging by their substratum, were not collected in precisely the same spot, it seems more likely that they are quite normal. In that case, we must conclude that, in certain cases, post-larval sponges may be reproductively active within a week of the time of metamorphosis. And since the embryos are nearly fully developed, and allowing for a short time (say, one day, at least) after metamorphosis before reproduction could begin, the period required in this species for the development of embryos may be fixed within from 3 to 6 days, and the probability is that it is nearer 3 days.

The only other accurate record of time for a sponge becoming reproductively mature is that of Wilson (1911), in which he figures an embryo in a two-month old individual which had developed from a regenerative cell-mass. The embryo figured is only in the early stages, and in the text Wilson remarks that : " in regenerated sponges that are kept one to two months in the live box reproductive bodies make their appearance." It is probable therefore that this early reproductive activity is common in sponges and may only be called precocious in comparison with other Metazoa.

SUMMARY.

From the examination of specimens of *Dictyoclathria beanii* (Bowerbank) from Naples it appears that :—

(1) Embryos (probably asexual) may be developed in the post-larva in less than a week from the time of metamorphosis.

(2) The fully developed larvæ are developed in a period which may be from three to six days or, more probably, less.

(3) In developing from the post-larval to the adult condition the skeleton passes through phases characteristic of the genera *Hymedesmia*, *Microciona*, possibly *Clathria*, and *Dictyoclathria*.

(4) *Myxilla banyulensis* (Bowerbank), *Clathria morisca* Schmidt, *Raspailia incrustans* Swartschewsky, *Artemisina mediterranea* Babić, *A. paradoxa* Babić, *Clathria gradalis* Topsent, and *C. transiens* Topsent are all synonymous with *Dictyoclathria beanii* (Bowerbank).

(5) Fully developed embryos have been found in November and in February.

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XLIX.—*Notes on the South African* Bittacidæ (*Mecoptera*). By H. G. WOOD, B.A.

THESE observations, including the descriptions of three new species, have been made from specimens of Bittacidæ in the South African Museum which, through the kindness of Dr. K. H. Barnard, I have examined.

The abbreviations utilized in the descriptions of wing-venation are as in Cat. Coll. Zool. Selys, Brussels, no. 84, fasc. 5, pt. 2, p. 115, fig. 125, Esben-Petersen, 1921. The drawings and wing-tracings are by the author, the latter having been executed by means of a projector. The drawings of the male genitalia show the segments of the abdomen distended; no hairs are illustrated unless these are of important diagnostic value.

The inclusion of the male genitalia in a key for the classification of the African Bittacidæ by Lestage (1929, Rev. Zool. Afr. vol. xviii. fasc. 1, pp. 17–21) is sound. The examination of the genitalia of dried material is always unsatisfactory, since many important features are concealed often by opaque overlying appendages and processes; *ergo* the genitalia of the various types should be soaked and cleared before accurate differentiation can be shown.

The shape of the penis is a definite diagnostic characteristic. As the figures of Esben-Petersen (1921) are inadequate, I am submitting new figures for the male genitalia of the types in the South African Museum named by Esben-Petersen. These are of *Bittacus montanus*, *B. nebulosus*, *B. peringueyi*, *B. selysi*, *B. testaceus*, and *B. walkeri*. The drawings include details of the anal pulvilli, since these are useful in distinguishing the different species. The penis is shown from a dorsal aspect, having been flattened to obtain a uniform standard of comparison throughout these observations.

The nomenclature of the male genitalia proposed by Tillyard (1926, 'Insects of Australia and New Zealand,' p. 328) is utilized throughout these observations. In the abdomen of the South African Bittacidæ the first segment is obsolescent or even absent as in the genus *Anomalobittacus* Kimmins. The ninth tergite in the male is much prolonged and deeply cleft, forming two specialized "claspers," the shape and size of which are of important specific value. The sternite below it is the ninth sternite, from which project posteriorly the gonopods, which in the Bittacidæ lie in a normal ventral position. In the Mecoptera these gonopods consist of two segments, namely, the gonostyle and the gonocoxite. In the Bittacidæ the gonostyle is small, is placed distally, and is partly or wholly fused with the gonocoxites. The gonocoxites themselves are partly fused, being bifid from a dorsal aspect. The penis and supporting structures ("ædeagus") project backwards between the gonopods.

The equivalent terms of importance employed by Esben-Petersen (1913, Rev. Zool. Afr. vol. iii. fasc. 1, pp. 139, 143; 1921, Cat. Coll. Selys, pp. 115, 133) and Lestage (1929, Rev. Zool. Afr. vol. xviii. pp. 17–21) are as follows :—

"Clasper" (Esben-Petersen, 1921)="genital valve" (Esben-Petersen, 1913) = "paraproctes" (Lestage) = "gonopods" (Tillyard).

"Upper anal appendage" (Esben-Petersen, 1917 *)= "upper appendage" (Esben-Petersen, 1921)="appendices superiores" (Esben-Petersen, 1913) = "forcipules" (Lestage, 1929)=clasper of ninth tergite (Tillyard).

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* Viz., Ann. S.A. Mus. vol. xvii. pt. 2, pp. 187, 190.

The illustrations of the male genitalia show the tenth ring-like segment or "proctiger" shaded black, the membrane giving rise to this proctiger being striped diagonally. The membrane between the tergites and sternites is represented by stippled shading.

Genus BITTACUS Latreille.

1805. Hist. nat. des Crust. et des Ins. vol. viii. p. 20.

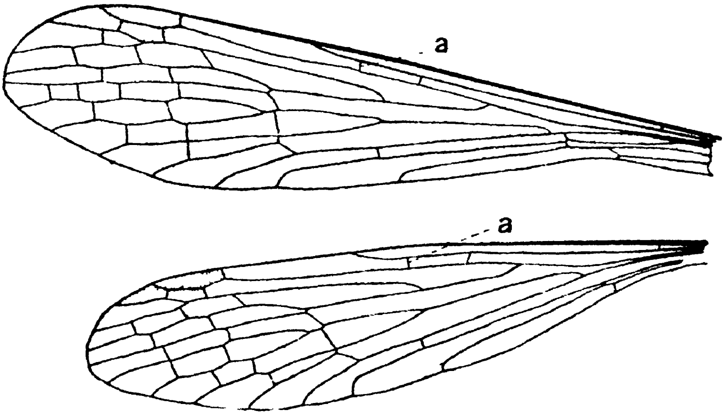
Bittacus natalensis, sp. n. (Figs. 1 & 2.)

Male.—Length 20, fore wing 20·5, hind wing 18 mm.

Female.—Length 20, fore wing 21·5, hind wing 19·5 mm.

Male.—Head with epicranium dark orange, remainder of head dark brown, ocelli enclosed by a black spot; labrum and maxillary palpi blackish brown, latter of normal shape (viz., Esben-Petersen, 1921, Cat. Coll. Zool. Selys, Brussels, no. 84, fasc. 5, pt. 2, p. 115); labial palpi yellow, tips darkened. Antennæ yellow, approximately three times as long as the thorax; scape sepia, swollen; flagellar segments filiform, with a pubescence of short hairs.

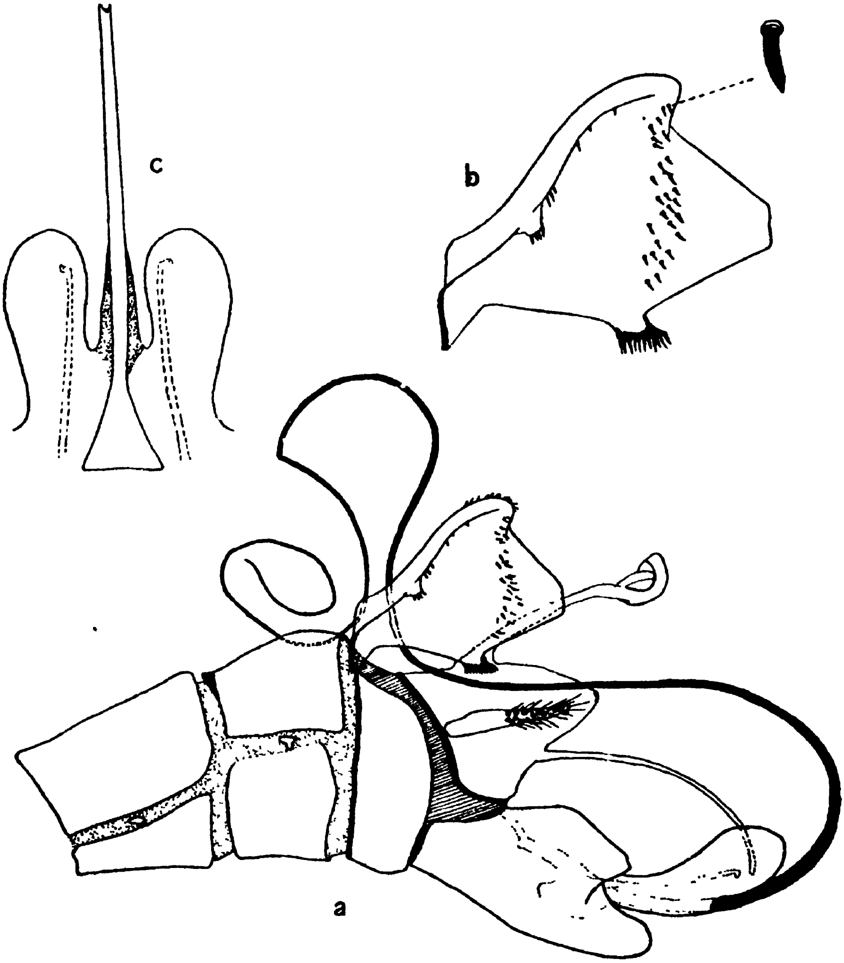
Fig. 1.



***Bittacus natalensis*, sp. n. Right fore and hind wing, showing extra *Scv*, indicated by "a."**

Thorax unicolorous, light brown, dorsal segments elevated. Wings (fig. 1) with a brown tinge, veins yellow; tip of fore wing clouded with brown from the stigma to the end of Cu_2, hind wing less clearly marked. No apical cross-vein in the costal area; one *Scv* in the normal wing, situate at least halfway between the origin and the fork of *Rs*, usually nearer the fork of *Rs* ; *frs* and *fm* in the same straight line ; *fm* with a white cloud ; *Cuv* slightly past *fm* ; first *A* ends slightly before *Cuv* ; no apical *Av* ; two *Pcv* ; stigma indistinct. Wings without any bristles on the margins near the base. Legs

Fig. 2.



Bittacus natalensis, sp. n.

a, end of abdomen and genitalia of ♂ (lateral view) ; *b*, upper appendage further enlarged (lateral view) ; c, penis with the penis-filum shortened (dorsal view).

with coxæ and trochanters similar in colour to the thorax, without any stout black bristles; femora yellow, tips with black bands, hind femur slightly thickened, cylindrical; tibiæ yellow, tips darkened, somewhat banded; spurs black; tarsi unicolorous, brown, hind tarsi with the basal joint longer than the second and third joints united, which are equal, fourth joint one-half of first, fifth joint slightly shorter than fourth.

Abdomen yellowish brown, with a yellowish pubescence, sternites paler, no spines on the lateral margins of the tergites. The specialized " clasper " of the ninth tergite, viewed laterally (fig. 2), is slightly concave, with the upper distal angle slightly produced, rounded; lower distal angle square; the lower margin produced near the centre into a pronounced tooth projecting inwards and slightly downwards, bearing numerous stout black spines; on the inner surface occur twenty-nine similar spines from the upper distal angle to near the lower marginal tooth; on the upper inner surface is a small tooth, directed downwards, bearing four to five stout spines; distal to this tooth is a group of three spines and three additional separate spines. Ninth sternite rounded at the upper distal angle, covered with fine hairs; gonopods with the upper margin slightly elevated in the mid-region, bifid when viewed dorsally, lower distal angle produced to a rounded projection, covered with a pubescence of fine hairs. Penis bi-lobed, lobes swollen slightly apically; penis-filum elongated, slender, tapering, arising from between the lobes of the penis, slightly chitinized at base. Anal pulvilli with the supra-anal plate hairy, elongated to a stout, cylindrical, membranous filament, spoon-shaped apically; the subanal plate is a slender, membranous, hairy, tapering filament. Laterally the reduced ring-like tenth segment bears two unsegmented cerci, covered on the distal half with cup-shaped tubercles bearing fine hairs.

Habitat.—South Africa.

Holotype, ♂, Bulwer, Natal, 1914 (*W. Haygarth*).

Allotype, ♀, id.

Types in the South African Museum.

Remarks.—In the right fore and hind wing occurs an extra *Scv* situate past *frs*. This is absent in the left fore and hind wings, and seems an abnormality.

Bittacus kunenensis, sp. n. (Figs. 3 & 4.)

Male.—Length 22, fore wing 24, hind wing 21·5 mm.

Head with epicranium dark orange, ocelli enclosed

Fig. 3.

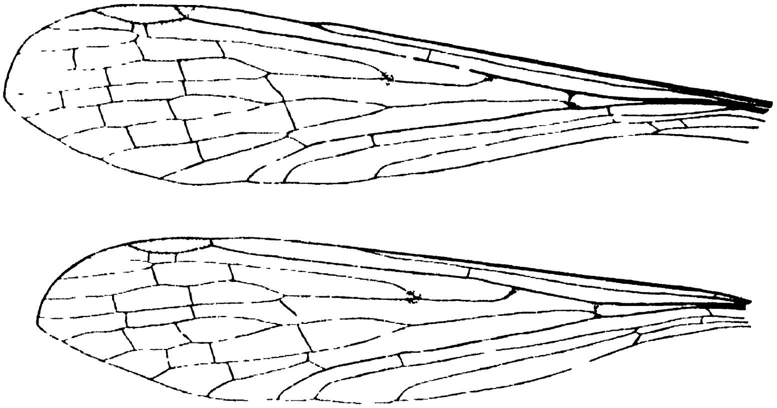
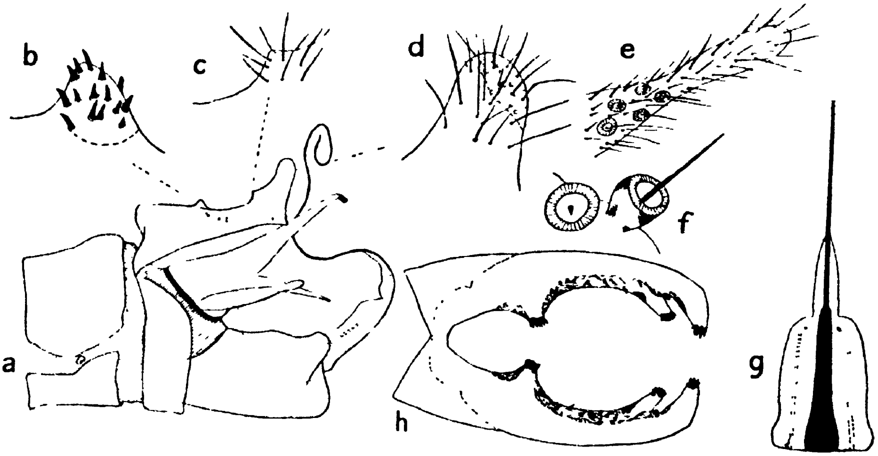


Fig. 4.



Bittacus kunenensis, sp. n.

Fig. 3.—Fore and hind wing.

Fig. 4.—*a*, end of abdomen and genitalia of ♂ (lateral view); *b*, anterior tooth enlarged; *c*, upper marginal corner enlarged; *d*, upper distal angle of clasper enlarged; *e*, end of cercus enlarged, showing constriction near its tip; *f*, cup-like tubercles of cercus bearing fine hairs; *g*, penis with the penis-filum shortened (dorsal view); *h*, ninth tergite or "claspers" (dorsal view).

by a black spot; frons and clypeus dark rusty brown; maxillary palpi black except the last joint, which is white with a narrow black basal ring; shape of palpi normal; labial palpi yellowish brown; labrum light reddish brown. Antennæ broken beyond the seventh segment, this portion as long as the thorax; brown, scape swollen, flagellar segments filiform, with a pubescence of short hairs.

Thorax unicolorous, light brown, dorsal segments elevated. Wings (fig. 3) with a brown tinge, veins yellowish brown. No apical cross-vein in the costal area; one *Scv*, situate halfway between the origin and the fork of *Rs* in the fore wing, very slightly proximal in the hind wing; *frs* and *fm* in the same line, *frs* with a brown spot, *fm* with a white spot; *Cuv* slightly past *fm*; first *A* ends slightly past *Cuv* in the fore wing (this is more clearly marked in the hind wing); no apical *Av*; two *Pcv*; stigma distinct, three to four times as long as broad; veins R, R_1, and Cu_1 strongly thickened; black bristles on the margin of the wings near the base. Legs with coxæ and trochanters similar in colour to the thorax, spineless; hind and middle tibiæ yellowish brown, fore femora yellow with the apical half brownish; tibiæ brown with the tips scarcely blackened; spurs dark brown; tarsal joints unicolorous, dark brown; basal joint of the hind tarsus longer by one-third than the second and third joints united, which are equal; fourth joint about one-half the first, scarcely swollen, slightly longer than the fifth joint.

Abdomen with a yellow pubescence, similar in colour to the thorax; sternites paler. The "claspers" are slender, moderately elongated; viewed laterally (fig. 4, *a*) with the proximal upper angle slightly rounded, distal upper angle produced into a pronounced rounded lobe, bent slightly inwards, with numerous closely grouped stout spines on inner surface; lower distal angle rounded; lower margin without any lobe or tooth; basal projection on upper margin directed inwards, with about fifteen stout black spines on the inner surface; the more distal projection without any spines; upper inner surface with nineteen stout spines; distal lower angle with many similar spines on the inner surface. Ninth sternite rounded at the upper distal angle, covered with fine hairs; gonopods roughly rectangular, hairy, bifid when viewed dorsally, with the upper margin slightly elevated in the mid-region; lower distal angle rounded.

Penis stout, slightly chitinized at base, tapering abruptly into the elongate slender penis-filum, which is reinforced strongly at the base. Supra-anal plate hairy, elongate, membranous, tip tapering, with a tuft of hairs directed downwards; subanal plate tapering to a blunt point, membranous, with few hairs. Cerci with an apparent constriction near the tip; hairy, covered with cup-shaped tubercles bearing fine hairs.

Habitat.—South-west Africa.

Holotype, ♂, Otjimbumbe, Kunene River, South-west Africa, March 1923 (South African Museum Expedition).

Bittacus pinguipalpi, sp. n. (Figs. 5 & 6.)

Male.—Length 19·5, fore wing 17, hind wing 15 mm.

Head dark yellow, ocelli enclosed by a black spot; labrum suffused with light brown; maxillary palpi light yellow; labial palpi darker; former with the first and second joints cylindrical, third joint equal to the fourth, swollen at the apex on the lower surface, fourth swollen to a lesser extent at the apex, fourth and third joints together equal to joints 1 and 2, fifth joint peg-like, tapering to a blunt point, shorter than the fourth joint, base one-half the thickness of the apex of the fourth joint; whole palpus with a dense pubescence of fine hairs. Antennæ three times the thorax, scape tinged with yellow, flagellar segments light brown, filiform, with a pubescence of short hairs.

Thorax unicolorous, dark yellow; dorsal segments elevated; anterior margin of the proepisternum with four small black bristles; each antero-lateral corner of the prothorax with a stout black bristle placed on a small tubercle. Wings (fig. 5) with black bristles on the margins near the base, tinged light brown, veins yellowish brown; no apical cross-vein in the costal area; one *Scv*, situate in the fore wing near *frs*, in the hind wing halfway between the origin and the fork of *Rs*; *frs* past *fm* in the fore wing, before *fm* in the hind wing; *Cuv* slightly before *fm* in the fore wing, more proximal in the hind wing; first *A* in the fore wing ends before *Cuv*, in the hind wing first *A* ends past *Cuv*; no apical *Av* in the fore wing, present in the hind wing; two *Pcv*; stigma distinct, two or three times as long as broad. Legs with the coxæ and trochanters similar in colour to the thorax, remainder

Fig. 5.

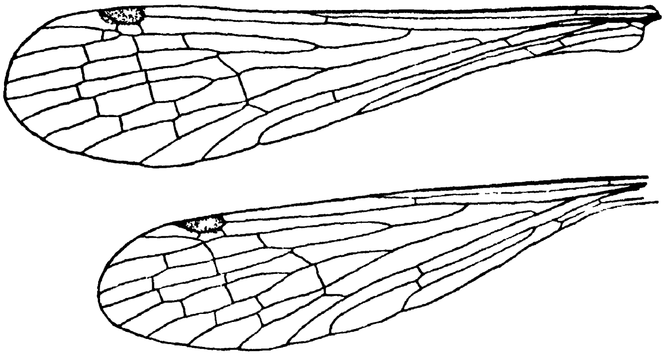
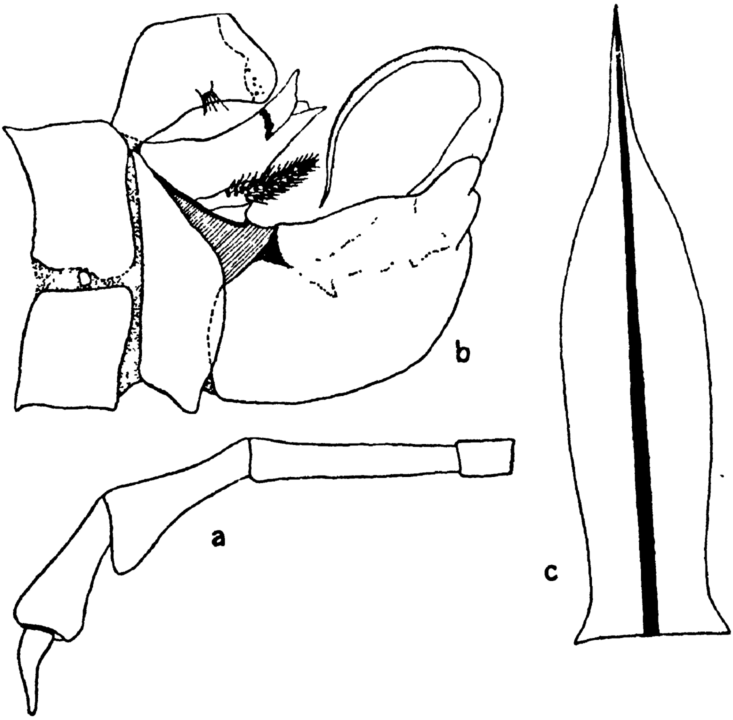


Fig. 6.



Bittacus pinguipalpi, sp. n.

Fig. 5.—Fore and hind wing.
Fig. 6.—*a*, maxillary palpus, lateral aspect; *b*, end of abdomen and genitalia (lateral aspect); *c*, penis, flattened (dorsal aspect).

of legs lighter yellow ; tips of femora with a black apical band, tibiæ with the tips darkened by brown ; fore coxæ with five black bristles on the posterior margin in addition to several long hairs on the surface, middle coxæ with black bristles on the distal anterior margin, hind coxæ with six to eight similar bristles on the posterior margin ; hind femora thickened, fusiform ; tarsi with tips of joints 1, 2, and 3 dark brown, somewhat ringed at the apex, basal joint of hind tarsus slightly longer than the second and third joints united, which are equal, fourth joint almost three-fifths of first joint, fifth joint less than one-half the first ; spurs yellowish brown.

Abdomen light yellow, paler beneath, lateral edges of tergites with five to nine black bristles.

"Clasper" of ninth tergite, viewed laterally (fig. 6), slightly concave, with the upper proximal and distal angles rounded ; lower distal angle slightly produced, rounded, bearing on the inner surface six stout spines ; posterior margin bent inwards ; mid-lower surface with a tooth bearing only several stout hairs or setæ on the apex, this tooth being situate on the inner surface of the clasper. Ninth sternite with the upper distal angle sloping, covered with a pubescence of fine hairs ; gonopods with the upper distal angle slightly produced to a blunt lobe directed inwards, bifid when viewed dorsally, lower distal angle sloping. Penis, viewed dorsally (fig. 6, *c*), a flat leaf-like structure, tip tapering to a sharp point, near the base a slight constriction. Supra-anal plate simple, tip rounded ; subanal plate simple. Cerci covered with cup-shaped tubercles almost to the base.

Habitat.—South-west Africa.

Holotype, ♂, Narebis, South-west Protectorate ; February 1921 (*Dr. K. H. Barnard*).

Type in the South African Museum.

Bittacus montanus Weele. (Fig. 7.)

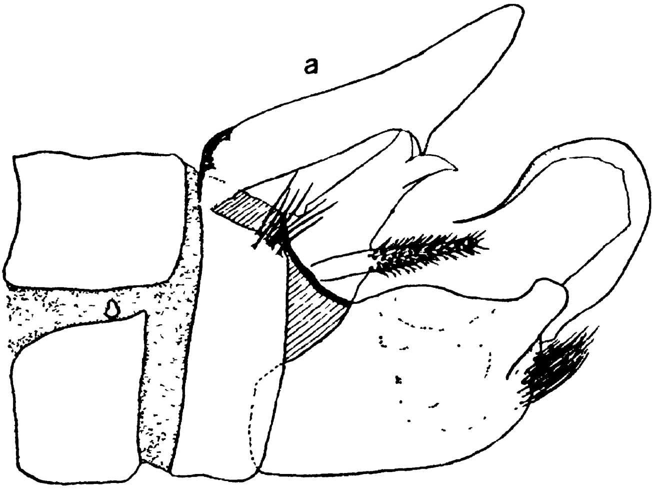
1909. Sjöstedt, Kilim.-Meru Exp., Neuroptera, p. 21, fig. 4.
1913. Esben-Petersen, Rev. Zool. Afr. p. 141, fig. 6.
1917. Lestage, Rev. Zool. Afr. pp. 113–116.
1921. Esben-Petersen, Cat. Coll. Selys, pp. 129, 130, fig. 144.
1929. Lestage, Rev. Zool. Afr. pp. 6, 7.

Additional records are as follows :—

Salisbury, Rhodesia, no date (*Dr. Melle*) ; 3 ♂♂, 3 ♀♀.
Kampala, Uganda, January 1920 (*R. A. Dummer*) ; 1 ♂.

Mulange, Marbira Forest, Uganda, 1920 (*R. A. Dummer*); 1 ♂, 2 ♀♀.

Remarks.—The specialized "clasper" of the ninth tergite, viewed laterally (fig. 7), concave, with the upper proximal angle rounded, lower margin parallel to near the centre of the clasper, then rounded into a pronounced inwardly directed tooth, which is spineless; this margin swells slightly beyond tooth, emerging into the broad rounded apex of the clasper; upper margin somewhat indented opposite the lower marginal tooth; the tooth situate at least halfway between the base and the apex of the clasper. Ninth sternite with seven elongate stout setæ on tubercles at the upper distal angle; gonopods with upper margin slightly elevated in the mid-region, gonostyle somewhat pronounced; pubescence of gonopods elongate. Penis, viewed dorsally, uniformly wide for three-quarters of length, then tapering abruptly to a



Bittacus montanus Weele.
a, end of abdomen and genitalia (lateral aspect); *b*, penis (dorsal view).

sharp joint. Supra-anal and subanal plates equal in length, membranous, hairy, tips rounded. Cerci covered with cup-shaped tubercles to near the base.

Esben-Petersen (1913, p. 141) states :—" Appendices superiores of the male as broad at the tip as at the base, with an obtuse, downwards directed dent in the middle of the ventral side."

By " dent " is meant a tooth.

In his Monograph of 1921, p. 130, Esben-Petersen submits a somewhat contradictory statement, namely, " In the series from British Museum and in the male from my own collection the dent on the underside of the upper appendages is placed nearer to the base than to the tip. . . . The above-named dent is sharply pointed and somewhat inwardly directed."

Lestage (1917, 1929) questions the statement that this tooth is " nearer to the base than to the tip." In his ' Tableau des *Bittacus* Africains ' (1929, p. 21) he states : " . . . . cette expansion dentiforme est généralement bien visible de profil et ne se trouve pas vers la base des forcipules."

The examination of six male genitalia of this species, including the type labelled by Esben-Petersen in the South African Museum, has revealed that the lower marginl tooth is situate at least halfway or even slightly past the centre of the clasper from the base to the apex.

This is in agreement with the above statement of Lestage (1929, p. 21).

Bittacus nebulosus Klug. (Fig. 8.)

1836. Abh. Königl. Akad. Wiss. Berl. p. 99.
1921. Esben-Peterson, Cat. Coll. Selys, pp. 138, 139.
1929. Lestage, Rev. Zool. Afr. p. 18.

The following are additional records :—

Eshowe, Natal, 1916 (— *Marley*) ; 1 ♂.

Port St. Johns, Pondoland, no date (*G. Shortridge*) ; 1 ♀.

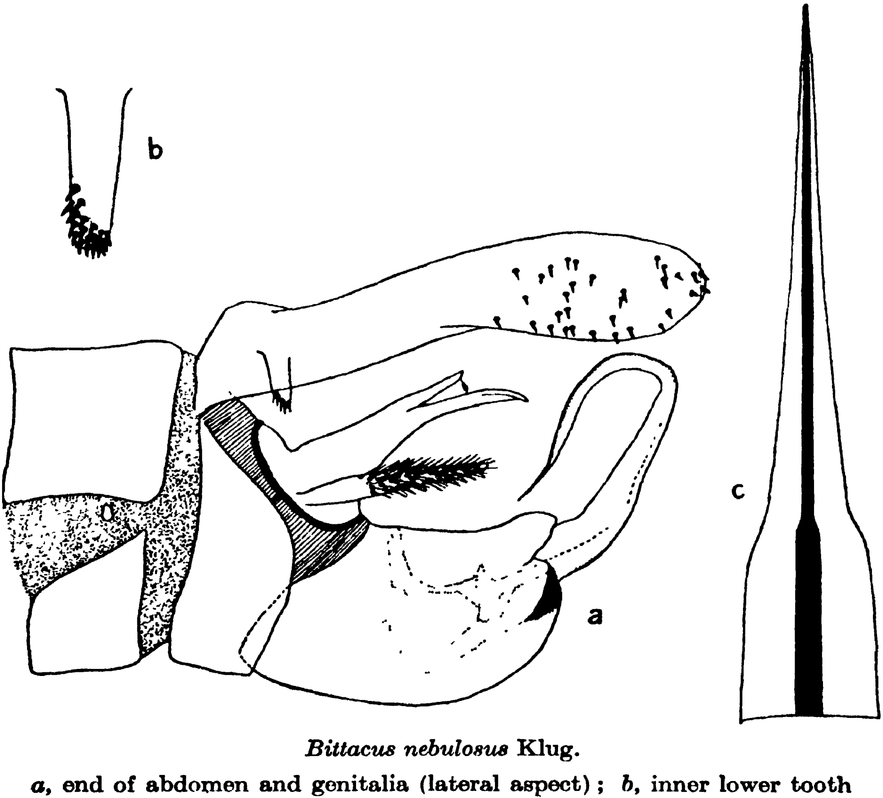
Remarks.—In the female from Port St. Johns the apical cross-vein in the costal area is absent.

In the female type labelled by Esben-Petersen, collected by Edwards at Barberton, Transvaal, 1911, the right fore wing has *Cv* past the fork of *Rs* and before *Scv*, left fore wing has *Cv* past the fork of *Rs* and past *Scv*, right hind wing has *Cv* before fork of *Rs* and before *Scv*, left hind wing has *Cv* absent.

Consequently the founding of new species merely on differences in wing-venation among females of *Bittacus* (as I shall show under the notes on *B. selysi* E.-P.) is precarious.

In the male the specialized "clasper" of the ninth tergite, viewed laterally (fig. 8), longer than the gonopods, slightly concave, almost flattened like the blade of a knife; upper proximal angle uneven, somewhat hump-like; posterior to this hump the clasper somewhat constricted; upper margin curved; last half of clasper

Fig. 8.



Bittacus nebulosus Klug.

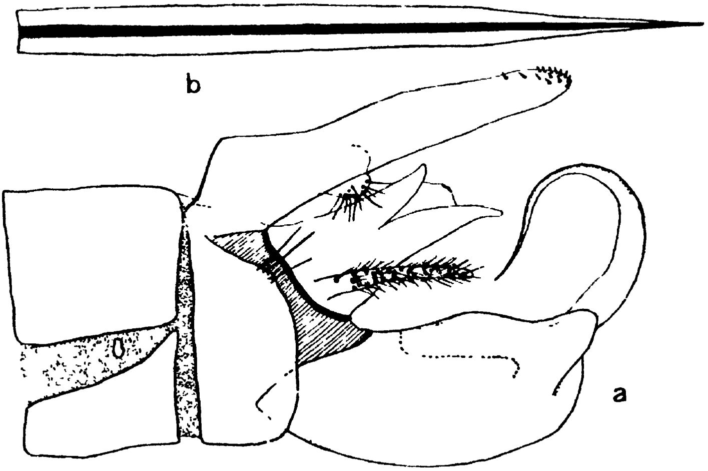
a, end of abdomen and genitalia (lateral aspect); *b*, inner lower tooth (further enlarged); *c*, penis (dorsal aspect).

swollen, with a broad rounded apex, bearing on the inner surface thirty-one to thirty-three stout black spines; lower margin almost parallel to the upper margin after the last anterior lower spine; near the base arises on the inner surface a slender somewhat elongated tooth (not apparent unless the genitalia are cleared in KOH), bearing numerous closely grouped stout black spines. Ninth sternite covered with a uniform pubescence of short hairs; gonopods with the lower margin rounded. Penis, viewed dorsally, wide at the base, almost parallel for one-fifth of its length, then abruptly constricted, tapering gradually after this to a sharp point. Subanal plate slightly longer than the supra-anal plate, both membranous, hairy, rounded apically. Cerci covered with cup-shaped tubercles.

Esben-Petersen (1921, p. 138, fig. 159) shows no inner tooth near the base on the "clasper." Lestage (1929, p. 18) states · "forcipules ♂ . . . . ., puis dilatés jusqu'au sommet, sans dent en dessous."

Thus, as stated in the introduction of this paper, the clearing of the male genitalia in KOH before examination and description cannot be too strongly stressed.

Fig. 9.



Bittacus peringueyi Esben-Petersen.
a, end of abdomen and genitalia; *b*, penis (dorsal aspect).

Bittacus peringueyi Esben-Petersen. (Fig. 9.)

1913. Rev. Zool. Afr. vol. iii. p. 144, fig. 11.
1921. Cat. Coll. Selys, pp. 135, 136, figs. 154, 155.

The following are additional records:—

Krantz Kloof, Natal, March 1915 (— *Marley*); 1 ♂.

Zoutpansberg, Louis Trichardt, Transvaal, February 1928 (*R. F. Lawrence*); 1 ♂.

Remarks.—The type labelled by Esben-Petersen (April 1894), collected by Lightfoot, shows that the "clasper" of the ninth tergite is slightly concave, elongated, somewhat longer than the gonopods, tapering to a broad blunt point; upper proximal angle almost square; apex with fifteen stout black spines, the majority of which occur on the inner surface; upper margin slightly undulating; lower margin almost straight, with a pronounced rounded lobe on the inner surface, with numerous stout setæ at the apex (fig. 9). Ninth sternite with the upper distal angle sloping, with three stout setæ on tubercles; gonopods with the lower margin rounded, elevated near the upper mid-region. Penis, viewed dorsally, uniformly wide, tapering abruptly near the tip to a sharp point. Supra-anal plate membranous, simple; subanal plate slightly longer than the supra-anal plate. Cerci covered with cup-shaped tubercles bearing fine hairs.

Bittacus selysi Esben-Petersen. (Fig. 10.)

1917. Ann. S.A. Mus. vol. xvii. pp. 187, 188, figs. 1, 2.
1921. Cat. Coll. Selys, pp. 128, 129, fig. 143.

Additional records are as follows :—

M'fongosi, Zululand. December 1916 (*W. E. Jones*); 1 ♂, 2 ♀♀.

Remarks.—The examination of the type from Durban (July 1913) and the male from Zululand has revealed the following characteristic genitalia :—

The "clasper" of the ninth tergite, viewed laterally (fig. 10), with the upper proximal angle uneven, hump-like, constricted posterior to hump-like angle, then swelling very slightly on upper margin, further constricted slightly before the curved and bluntly pointed apex, which bears five stout black spines *; opposite the latter constriction the lower margin of clasper swells abruptly, giving rise on the central lower portion to a sharply pointed inwardly directed tooth, without any spines but with several stout hairs on the distal outer surface; proximal to this tooth on the inner surface a small lobe bearing eight stout long hairs (this lobe not apparent unless the genitalia are cleared in KOH); in dorsal view the apices of the "claspers" widely separate.

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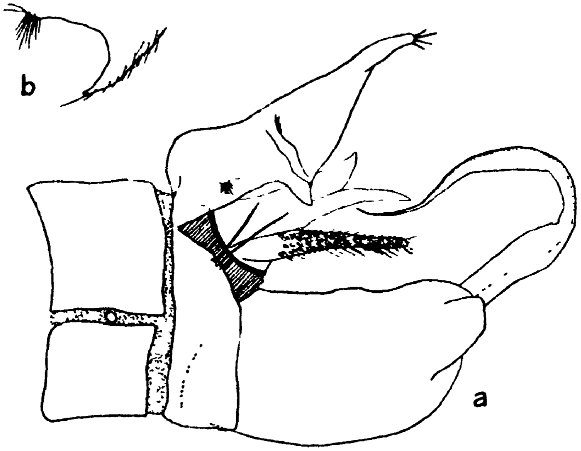
* Esben-Petersen (Ann. S.A. Mus. 1917, p. 187) states that apex of clasper has two to three strong spines.

Ninth sternite with two or three stout elongate setæ at the upper distal angle; gonopods with lower margin rounded. Penis, viewed dorsally, uniformly wide for three-quarters of its length, then tapering to a sharp point. Cerci covered with cup-shaped tubercles.

In the two females from M'fongosi, caught at the same time, variations occur. 1 ♀, normal wing venation, that is, no *Av* present. Second female, *Av* present in all wings except in the right hind wing; in the left fore wing *Av* thin and somewhat atrophied.

R. P. L. Navás (1930, Rev. Zool. Afr. vol. xix. p. 311, fig. 27) describes *Bittacus elisabethæ* Navás, as a new species.

Fig. 10.



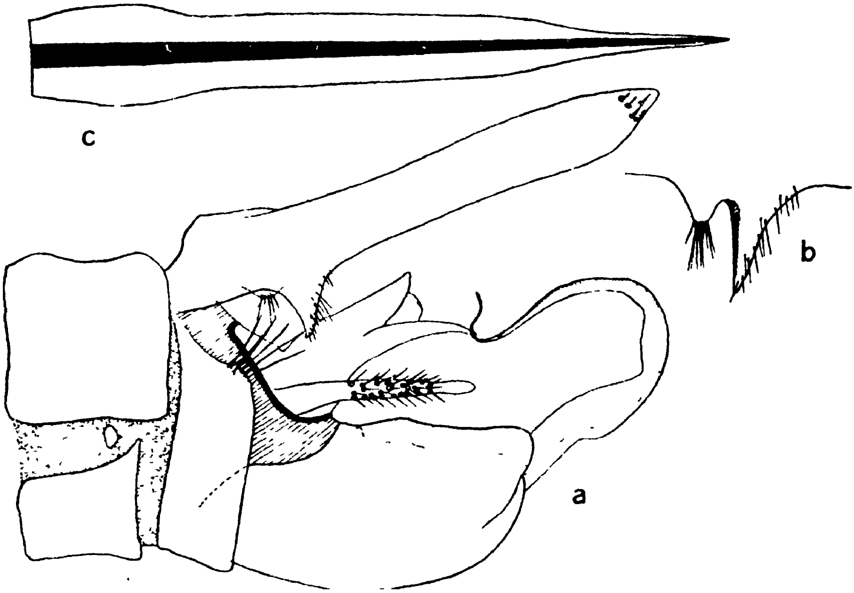
Bittacus selysi Esben-Petersen.

a, end of abdomen and genitalia (lateral aspect); *b*, lower marginal tooth, further enlarged (posterior aspect); *c*, penis (dorsal aspect).

He states: " Espèce semblable au *B. selysi* Peters par la forme des ailes (Petersen, Mecoptera, p. 128, pl. ii. fig. 21); mais elle s'en distingue outre les couleurs, par l'absence de la veinule axillaire externe, ce qui l'en sépare au premier coup d'œil."

It is impossible to differentiate the two females from M'fongosi from this *B. elisabethæ* Navás on the colour and general characteristics. As shown above the second female reveals a transitional type of wing-venation between *B. selysi* E.-P. and *B. elisabethæ* Navás. It is not improbable that the presence of *Av* in Navás's specimen (♀) is an individual and not a specific characteristic, for the figure of the wing of *B. elisabethæ* Navás coincides with the fore wings of this remarkable female from M'fongosi.

Fig. 11.



Bittacus testaceus Klug.

a, end of abdomen and genitalia (lateral aspect); *b*, lower margina and inner teeth (posterior aspect), enlarged; *c*, penis, flattened (dorsal aspect).

Bittacus testaceus Klug. (Fig. 11.)

1836. Abh. Königl. Akad Wiss. Berlin, p. 98.
1913. Esben-Petersen, Rev. Zool. Afr. p. 139.
1921. Esben-Petersen, Cat. Coll. Selys, pp. 132, 133.

Additional records are as follows :—

Insiza, Southern Rhodesia, January 1919 (*G. French*). 1 ♂.

Durban, Natal, no date (— *Leigh*) ; 1 ♂.

Remarks.—The examination of the type labelled by Esben-Petersen, collected by Edwards at Barberton, Transvaal, has revealed the following characteristics :—

The "clasper" of the ninth tergite, viewed laterally (fig. 11), is long and slender, flattened posterior to the mid-region into a thin blade; upper proximal angle uneven, almost square; apex of this clasper tapering to a blunt point, on the inner surface of which occur five stout black spines; lower distal angle gently rounded; lower margin and inner surface giving rise near the base to a tooth directed downwards and inwards, with numerous fine hairs on the distal surface, without any hairs on the proximal margin or surface; adjacent to this tooth is a small rounded lobe on the inner surface, bearing a tuft of fine hairs (fig. 11, *b*); the whole clasper almost twice as long as the gonopods. Ninth sternite rounded at the upper distal angle, covered with fine hairs, with six elongate stout setæ placed on tubercles at the upper distal angle; gonopods with the upper margin slightly near the base, bifid when viewed dorsally, lower margin and distal angle rounded. Penis swollen at the base, tapering gradually to a point in the last quarter of its length. Supra-anal plate membranous, rounded apically, hairy; subanal plate similar, slightly longer than the supra-anal plate. Cerci with an apparent constriction near the tip, with cup-shaped tubercles.

The two males from Durban and Insiza reveal similar genitalia. The figures of *Bittacus testaceus* Klug given by Esben-Petersen (1913, p. 139, fig. 2, and 1921, p. 132, fig. 148) show no lower marginal tooth. Lestage (1929, Rev. Zool. Afr. p. 20) states: "Forcipules ♂ presque 2 fois plus longs que les paraproctes, fortement bossues au dessus à la base, l'ensemble en lame de couteau; pas de dent interne."

Bittacus walkeri Esben-Petersen. (Fig. 12.)

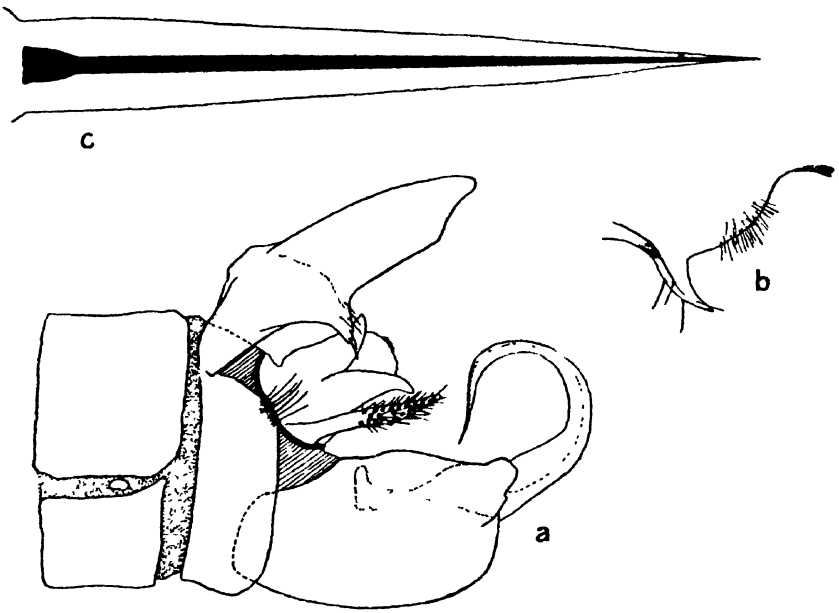
1915. Ent. Meddelelser, Kjobenhavn, vol. x. p. 236.
1917. Ann. S.A. Mus. vol. xvii. pt. 2, p. 189.
1921. Cat. Coll. Selys, p. 131.

Remarks.—In the figures of *Bittacus walkeri* E.-P. (1917, fig. 4) Esben-Petersen shows the lower margin of the ninth tergite with a projection. He states on p. 190 of the same paper that the "lower margin of appendages (seen from side) with a triangular projection near base." The figure 146 (1921) lacks this projection; the shape of the ninth tergite also varies. A comparison with the figure by the author will show that figure 4 (1917) is more correct than that of 1921.

The following notes are useful for distinguishing this species :—

Ninth tergite with the upper margin slightly curved, the proximal upper angle projecting squarely ; upper distal angle produced into a pointed rounded apex without any spines ; lower distal angle less rounded ; lower margin straight, giving rise near the base to a pronounced tooth, bearing several stout bristle-like setæ on the distal surface and margin ; adjacent to this tooth on the inner surface occurs a slight curved lobe bearing numerous hairs and emerging into the marginal tooth. Ninth sternite with the upper distal angle bearing seven or eight stout setæ. Supra-anal and subanal plates equal in length, membranous, hairy, tips rounded. Penis, viewed dorsally, wide at the base, tapering gradually to a sharp point (fig. 12). Cerci covered with cup-shaped tubercles.

Fig. 12.



Bittacus walkeri Esben-Petersen.

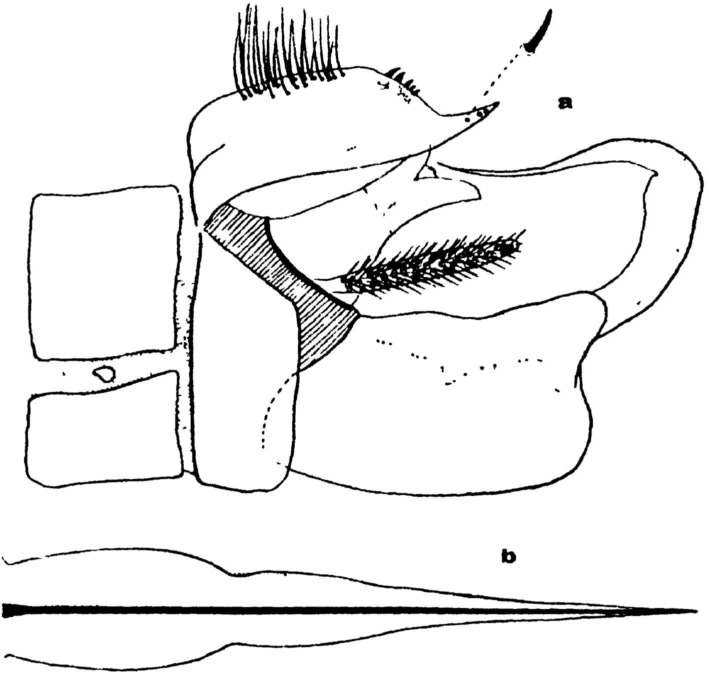
a, end of abdomen and genitalia (lateral aspect) ; *b*, inner lower marginal tooth and adjacent lobe (posterior aspect) ; *c*, penis (dorsal aspect).

Bittacus capensis Thunb. (Fig. 13.)

1784. *Panorpa capensis* Thunberg, Nov. Sp. Ins. Diss. iii. p. 67, fig. 78.
1836. *Bittacus capensis* Klug, Abh. Kön. Wiss. Berl. p. 97.
1913. Esben-Petersen, Rev. Zool. Afr. p. 138.
1921. Esben-Petersen, Cat. Coll. Selys, p. 134, figs. 150, 151.
1929. Lestage, Rev. Zool. Afr. p. 20.

Mr. J. Hewitt, Director of the Albany Museum, Grahamstown, has kindly sent for examination one male from Karenga, collected by E. G. Webber (no date).

Fig. 13.



Bittacus capensis Thunb.

a, end of abdomen and male genitalia (lateral aspect); *b*, penis (dorsal view).

The following notes will supplement those of Esben-Petersen (1921, p. 134):—

Fore wing, hind wing 17 mm.

Abdomen brown. The ninth tergite, viewed laterally (fig. 13), slightly concave, broad at the base, with the upper proximal margin somewhat curved; upper distal angle sloping sharply into a prolonged, strongly pointed, narrow, inwardly curved apex, which bears on the inner surface three to four stout black spines; on the inner surface adjacent to the sloping upper margin occur four to five similar spines, clearly visible from a lateral aspect. Inner surface of the ninth tergite swollen into a wide undulation, bearing numerous elongate, stout, backwardly directed hairs; similar hairs on the upper margin proximal to sloping, rounded, upper distal angle; lower margin without any basal projections or teeth. Ninth sternite slightly rounded at the upper distal angle, covered with fine hairs; gonocoxites with the upper margin almost straight, bifid when viewed dorsally, lower distal angle produced to a rounded projection, covered with a pubescence of fine hairs. Penis, viewed dorsally, swollen at the base, with a slight constriction at the end of this swelling, remainder of penis gradually tapering to a thin point, the portion near the constriction slightly swollen. Cerci covered with cup-shaped tubercles bearing fine hairs.

The figure 151 (Cat. Coll. Selys, p. 134, 1921) by Esben-Petersen of the male hypopygium shows no stout black spines on the apex of the ninth tergite.

Genus ANOMALOBITTACUS Kimmins.

1928. Ann. & Mag. Nat. Hist. (10) vol. i. pp. 395–396.

Anomalobittacus gracilipes Kimmins. (Fig. 14.)

1928. Ann. & Mag. Nat. Hist. (10) vol. i. p. 396, fig. 1.

Described from fresh alcoholic material.

Female.—Length 15·5, fore wing 1·75, hind wing 1·2, antennæ 4·8, hind femur 6·5, tibia 6·75, tarsus 6·3 mm.

Head pale orange, ocelli enclosed by a black spot, from the posterior margin of which arises a dense pubescence of black hairs in the form of a blunt V, tapering to two-thirds the distance between the black ocellar spot and the articulation of the head with the neck; frons and clypeus suffused with black; labrum black; maxillary and labial palpi yellowish brown, densely covered with black hairs, the shape of the former as in the genus *Bittacus.* Antennæ dark brown, filiform, two-and-a-half times as long as the thorax, with a pubescence of short black hairs; first basal joint short-cylindrical, a little longer than its broadest diameter, second basal joint globular, as wide as the first basal joint.

Thorax light yellow, with the three dorsal segments subequal, flattened. Anterior margin of the prothorax slightly blackened, the entire lateral margin darkened by a dense black irregular band; each antero-lateral corner with a black spine placed on a small tubercle; the bands on the meso- and metathorax smaller, more narrow, and a lighter black. Pleura light yellow; proepisternum with the upper margin darkened by a thin black band, oval when viewed laterally, with the anterior margin rounded; prosternum with a black triangular mark, the apex of which is elongated anteriorly to a sharp tapering point. Wings present, but reduced to slender filaments, slightly swollen at the bases, with the fore wing about seven-eighths and the hind wing three-fifths the length of the thorax. Legs with coxæ and trochanters the same colour as the body; femora and tibiæ darker yellow, the tips of the latter blackened; coxæ with several small scattered spines on surface; in addition the fore coxæ yellow, with three stout black spines on the anterior surface; distal corner of middle and hind coxæ with a single stout black spine; each trochanter with a black spine on the distal tip of the posterior margin; remainder of legs covered with close regular rings of short black hairs, throughout which are scattered many larger stouter black spines; spurs black, those on the hind tibiæ two-thirds the length of the basal joint of the hind tarsus, this joint equal to the second and third joints united, these latter joints being equal, fourth joint slightly swollen, fusiform, tapering near the tip, about five-eighths of first, fifth joint one-half of first; whole tarsus brownish yellow, the tips of joints 1, 2, and 3 blackened; claws small.

Abdomen the same colour as the thorax, covered with a yellow pubescence: lateral margins of the tergites with from two to six stout black spines.

Habitat.—South Africa.

Allotype, ♀, French Hoek Pass, French Hoek, Cape Province, 14th December, 1932 (*Dr. K. H. Barnard*).

Paratypes, 2 ♂♂, id. (*Dr. K. H. Barnard* and *H. G. Wood*).

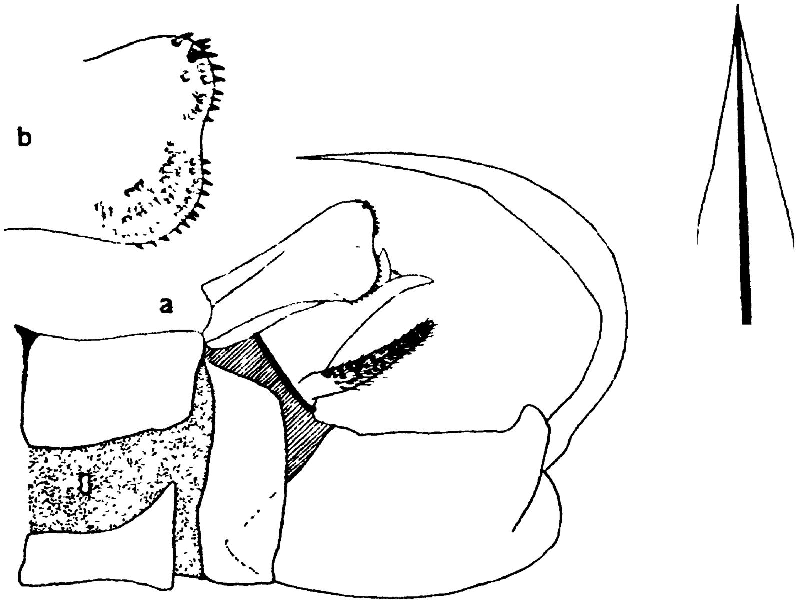
Types in the South African Museum.

Environment.—Along the margins of an irrigation furrow, 1 foot wide, on vegetation comprised chiefly of *Osmi-*

topsis asteriscoides, *Elegia verticillata*, *Leucadendron*, and Leguminosæ.

Remarks.—The genotype, *Anomalobittacus gracilipes* Kimmins, was described from a single male specimen. The examination of the three specimens from French Hoek revealed many differences from the genotype of Kimmins. The basal joint of the hind tarsus is not longer than but equal to the second and third joints united, these joints being equal. In this respect these specimens resemble more closely the Californian genus *Apterobittacus* MacLachlan (1893). The fore wing is seven-eighths (and not two-thirds) the length of the thorax; the hind wing is three-fifths the length of the thorax (no measurement is given by Kimmins). Only two black bristles occur on the anterior margin of the prothorax (Kimmins states that the anterior margin of the prothorax is with a number of black bristles). The margins of the three thoracic segments are banded with black (Kimmins

Fig. 14.



Anomalobittacus gracilipes Kimmins.

a, end of abdomen and genitalia (lateral aspect); *b*, distal margin of "clasper" (further enlarged); *c*, penis (dorsal aspect).

mentions no black or dark bands on the thoracic segments of the genotype).

Additional notes on the male genitalia of *Anomalobittacus gracilipes* Kimmins are as follows :—

Abdomen similar in colour to the female. The "clasper," viewed laterally (fig. 14), is slightly concave, with the upper and lower distal angles rounded, the former slightly produced and bearing eleven stout black spines, the latter with twenty-nine similar spines, these spines being borne on the inner surface of the "clasper" and directed inwards and downwards. Ninth sternite rounded at the upper distal angle, covered with fine hairs; gonopods roughly rectangular, bifid when viewed dorsally, with the upper distal angle produced into a small rounded arm, the "gonostyle," curving inwards, bearing several short fine hairs; lower distal angle rounded. Penis curved, strongly chitinized at the base; uniformly wide when viewed dorsally (fig. 14, *b*) at the base for one-third of its length, then swells into a flat leaf-like structure, tip tapering. Supra-anal plate slightly shorter than the subanal plate, membranous, hairy, the tip divided into two small rounded lobes; subanal plate spoon-shaped, membranous, hairy, tip rounded, simple. Laterally from the reduced ring-like tenth segment arise two unsegmented cerci, of moderate length, cylindrical, covered with cup-shaped tubercles bearing fine hairs.

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1926. Brotéria, Zool. vol. xxiii. fasc. 2, p. 89, fig. 4.
1926. Ent. Mitteil. vol. xv p. 59, fig. 11.
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L.—*On a small Collection of Ants made by Dr. F. W. Edwards in Argentina.* By HORACE DONISTHORPE, F.Z.S., F.R.E.S., &c.

THIS small paper deals with a few ants taken by Dr. F. W. Edwards in Argentina, Territory Rio Negro, in 1926, which have recently been handed over for me to study. They consist of nine species, of which no less than five are new to science. The chief interest in connection with this small collection of ants rests on the fact that there are three species of *Acanthomyops* Mayr (=*Lasius* F., nec Jurine) present. The ants of this genus were known heretofore to belong only to the purely north temperate fauna, being common to the Palæarctic (Europe and India) and Nearctic Regions (N. America). There exists, however, some relationship between the faunas of western U.S.A. (Lower California &c.) and Chile. My friend Dr. Jordan tells me the best-known example is the Carabid genus *Ceroglossus*, which is closely related to the northern genus *Carabus*. It occurs only in Chile, and there is no *Carabus* anywhere in South America, there being also no *Carabus* in Central America. Dr. Jordan suggests that the explanation, which the geologists will not admit, is a former land-connection west of the present coast of S. and C. America, from Lower California to Chile—perhaps a chain of islands. It has also been suggested that such insects as these may have extended their range from N. America along the chain of mountains of the Andes. It is most interesting that there is the same large gap in the distribution of *Acanthomyops* as in *Carabus*.

The following is a list of the ants collected, with descriptions of the new species :—

MYRMICINÆ.

Pogonomyrmex (*Pogonomyrmex*) *ater*, sp. n.

☿.—Jet-black, shining, legs and funiculi of antennæ brown, tarsi and trochanters lighter, whole body furnished with dark, longer and shorter, bristly hairs, erect on head and thorax, suberect on rest of body and legs.

Head rectangular, covered with raised longitudinal ridges, the spaces between very closely covered with a network of punctures ; *mandibles* strongly longitudinally striate with some large scattered punctures in the striæ, armed with six teeth, the three basal ones being shorter than the rest, last joint long and pointed, undersides furnished with recurved hairs; *clypeus* with anterior border straight, furnished with long curved hairs; *frontal area* small, circular, with a distinct median carina; *antennæ*: *scape* with fine longitudinal ridges and small scattered punctures, a few very fine decumbent hairs, and some longer suberect bristly hairs are present, when the scape is bent back it does not quite reach posterior angles of the head; *funiculus* with 1st joint longer than 2nd, 2nd longer than 3rd, 3rd–11th increasing in length and breadth, last joint not much longer than penultimate; under side of head with the usual psammophore, or beard, of long recurved hairs. *Thorax* with a network of strongly raised ridges, circular round anterior angles of pronotum longitudinal at sides, and transverse on epinotum, the spaces between finely punctured but shining; *epinotum* slightly concave, with two short sharp spines directed slightly upwards and outwards, declivity deep, slightly concave, the posterior angles armed with a second pair of short sharp spines directed upwards and outwards; *petiole* smooth and shining, the *peduncle* about the same length as the node, armed with a short triangular tooth beneath, anteriorly; *node* high, somewhat pointed, the anterior side not as long as the flat sloping downward dorsal side; *postpetiole* bell-shaped, broadest just before apex, smooth and shining. *Gaster* smooth and shining. *Legs* smooth and shining. *Long.* 4·6–6·2 mm.

♀.—Colour, sculpture, and pilosity much as in the ☿. The *head* is broader; *eyes* larger, the anterior margin of *mesonotum* raised and angled; the *scutum* of mesonotum and the *scutellum* are longitudinally striate, the interstices consisting of raised ridges; the *epinotum* is of similar structure to that of the ☿, but the teeth are somewhat longer. *Wings* iridescent with two closed cubital cells, a discoidal and closed radial cell, *pterostigma* and *veins* light brown. *Long.* 8 mm.

♂.—Colour as in ☿ and ♀, pilosity longer and more abundant.

Head exclusive of mandibles and including eyes a little broader than long, rounded behind; *mandibles* longitudinally striate, armed with four teeth; *clypeus* convex, slightly rounded in front, smooth in centre, longitudinally striate at sides ; *frontal area* larger than in ☿ and ♀ with a distinct median carina ; *front* longitudinally striate ; *temples* and *occiput* with the raised ridge more widely separated ; *eyes* large, prominent ; *ocelli* larger and more prominent than in ♀ ; *antennæ* : *scape* when bent back not reaching posterior angles of head ; *funiculus* with 1st joint much shorter and a little broader than second, 2nd shorter than 3rd, 3rd than 4th, 4th, 5th, and 6th about equal, 7th–11th constricted at apex and base, decreasing in length, last joint pointed, barely as long as the two preceding taken together. *Thorax* : *mesonotum* convex, projecting over pronotum, with raised anterior margins, disc with rather widely separated longitudinal raised ridges, spaces between smooth ; *mayrian furrows* distinct, rather wide and deep ; *scutum* of mesonotum with closer raised longitudinal ridges ; *scutellum* convex, with close fine raised longitudinal ridges ; *epinotum* smooth between the very blunt projections which take the place of the teeth in the ☿, teeth at base of declivity also much blunter ; *petiole* with *node* not as high and more rounded than in the ☿ ; *post-petiole* bell-shaped, broadest at apex ; *gaster* oval, rounded in front and narrowed behind, longer than in the worker ; *penicili* present ; *genitalia* retracted. *Wings* as in the ♀. *Long.* 5·8 mm.

Described from 5 ☿☿, 8 winged ♀♀, and 2 ♂♂, taken by Dr. Edwards at Maquinchao, 2000 ft., Argentine, Terr. Rio Negro, 24. x. 1926. Type and allotypes in Coll. Brit. Mus.

Solenopsis geminata F. 2 ☿☿, Maquinchao, 24. x. 26.

Solenopsis clytemnestra Emery. 24 ☿☿, 3 deälated ♀♀, Bariloche, 2500 ft., 5. xi. 26.

DOLICHODERINÆ.

Iridomyrmex bicolor, sp. n.

☿.—Yellowish red, antennæ, palpi, eyes, legs, and gaster black ; clothed with very fine decumbent grey pubescence, and a few short yellow hairs. *Head* without mandibles subquadrate, not emarginate posteriorly ; *mandibles* large, longitudinally striate, with terminal tooth long and pointed ; *clypeus* convex, shining, with four punctures arranged along the anterior border ;

eyes large, placed laterally and rather forward on head; *antennæ* long, *scape* slightly curved, a little broadest before apex, when bent back reaching beyond posterior border of head by about one-third of its length; *funiculus* with joints elongate, 1st joint longer and a little broader than 2nd, 2nd-5th subequal, 6th-9th gradually decreasing in length and increasing in breadth, 10th a little longer than broad, last joint about once and a half as long as the one preceding. *Thorax* narrow; *pronotum* convex, rounded at sides; *epinotum* convex, globose, higher when seen in profile than mesonotum; *node* of *pedicel* long, pointed, inclined forward, flat anteriorly and posteriorly; *gaster* small, narrow-oval, not quite twice as long as broad. *Legs* long. *Long.* 3·2 mm.

Described from a single worker taken by Dr. Edwards at the eastern end of Lake Nahuel Huapi, 2000 ft., 28-31. x. 26. Type in Coll. Brit. Mus.

FORMICINÆ.

Acanthomyops (*Donisthorpea*) *edwardsi*, sp. n.

☿.—Yellowish brown, posterior part of head and gaster darker, eyes black; whole body smooth and shining (the front of head, mesonotum, and epinotum, however, very finely punctured when seen under a strong power); pubescence very sparse and minute, a few scattered hairs on head and gaster. *Head*, without mandibles, slightly longer than broad, somewhat rounded behind, with posterior border straight; *mandibles* long, striate, masticatory margin furnished with five rather sharp teeth, the last long and pointed, 2nd to 4th longer than 1st; *clypeus* broader than long, convex, distinctly carinate, anterior border straight (the carina from one point of view, however, gives it the appearance of being pointed); *frontal area* conspicuous, but with basal portion indistinctly defined; *ocelli* minute, but distinct; *frontal furrow* very faint; *eyes* oval, slightly prominent; *frontal carinæ* short but well marked; *antennæ* fairly long, *scape* without outstanding hairs, very slightly curved, when bent back reaching beyond margin of head by about one-fourth of its length; *funiculus*, 1st joint longer and broader than 2nd, 2nd-12th gradually increasing in breadth, 2nd slightly longer than 3rd, 3rd and 4th of about equal length, 5th-12th gradually increasing in length, 12th pointed, about equal in length to 10th and 11th taken together; *maxillary palpi* 6-jointed, 3rd joint being the longest; 1st joint shorter than 2nd, 6th slightly longer than 4th and 5th, 5th and 6th taken together much longer than 4th.

Thorax: *prothorax* broad, rounded; *mesothorax* convex, oval, not as high as epinotum when seen in profile; *meso-epinotal furrow* well marked; *epinotum* convex, rounded above, basal declivity slanting, slightly concave. *Scale* high, wedge-shaped, broadest in middle, narrowed at apex, deeply emarginate, forming two sharp points.

Gaster moderate, with sides and base rounded, narrowed to apex. *Tibiæ* without outstanding hairs. *Long.* 3·4 mm.

♀.—Colour as in the ☿, the puncturation rather more conspicuous, the pubescence on gaster slightly more evident.

Head much as in ☿, narrower than thorax; *teeth* on *mandibles* stronger; the *frontal furrow* distinct; *scape* of *antennæ* without outstanding hairs. *Scale* as in the ☿, but thicker. *Gaster* rather short and not voluminous. *Tibiæ* without outstanding hairs. *Wings* slightly infuscate, discoidal cell present in all the specimens. *Long.* 4·6–5·8 mm.

♂.—Lighter or darker brown, mandibles, antennæ, palpi, legs, and external genital organs yellow, shining, slightly punctured and pubescent.

Head small, triangular; *mandibles* with masticatory margin armed with five teeth; *clypeus* broad, convex; *frontal area* indistinctly defined; *frontal furrow* very faint; *ocelli* very distinct; *front* with a somewhat deep oval pit before median ocellus; *eyes* large, prominent; *antennæ*, scape long, without outstanding hairs, 1st joint of *funiculus* longer and broader than 2nd, 3rd–13th gradually increasing in length and slightly in breadth, last joint not quite as long as the two preceding taken together. *Thorax* narrowly yellow at insertion of wings. *Scale* thick, high, rounded at sides and apex. *Wings* as in the ♀, but with discoidal cell in one specimen present on one fore wing and not on the other, absent from both in another, and present on both in a third. *Tibiæ* without outstanding hairs. *Long.* 3·8 mm.

Described from 5 ☿☿, 4 winged ♀♀, and 3 ♂♂ taken by Dr. Edwards at L. Correntoso, 2500 ft., 18–25. xi. 26

(2 winged ♀♀ were taken at L. Nahuel Huapi, Puerto Blest, 2500 ft., 2–3. xii. 26). Type and allotypes in Coll. Brit. Mus.

Acanthomyops (*Chthonolasius*) *negrensis*, sp. n.

♀.—Dark brown, shining, mandibles, clypeus, cheeks, antennæ and legs brownish yellow ; clothed with fine decumbent yellowish-grey pubescence, and scattered yellow outstanding hairs ; puncturation very fine and close. *Head* as broad at base as thorax ; *mandibles* long, longitudinally striate, and with a few widely separated punctures, masticatory margin furnished with eleven pointed teeth, terminal tooth rather long, penultimate tooth longer than those before it, 1st tooth shortest, 2nd bifid ; *clypeus* broad, convex, subcarinate ; *frontal area* large and indistinctly defined ; *frontal furrow* faint ; *eyes* large, prominent ; *front* with a small circular pit before median *ocellus* ; *antennæ* long, *scape* with outstanding hairs, when bent back reaching beyond margin of head by about one-third of its length, 1st joint of *funiculus* longer and broader than 2nd, 2nd very slightly longer than 3rd, 3rd–11th (=12th joint of antenna) increasing in length and breadth, 11th about equal to the two preceding it taken together. *Thorax* broad, convex ; *scale* broadest in middle, apex distinctly but not deeply emarginate ; *gaster* broader than thorax, but not very voluminous. *Wings* slightly infuscate ; *veins* and *pterostigma* yellow. *Tibiæ* with outstanding hairs. *Long.* 8·6 mm.

Described from a single winged ♀ taken by Dr. Edwards at L. Nahuel Huapi, Eastern End, 17. xi. 26. Type in Coll. Brit. Mus.

Acanthomyops (*Chthonolasius*) *rufo-niger*, sp. n.

☿.—Head, thorax, scale, and scapes of antennæ light brownish red, eyes black, gaster black, reddish at extreme base ; mandibles, legs, and funiculi of antennæ brown, shining ; pubescence fine and sparse ; a few scattered yellow hairs, which are longer on gaster.

Head rather large, broadest before base, sides rounded, posterior border slightly rounded ; *mandibles* massive, longitudinally striate, masticatory border armed with six blackish pointed teeth, the terminal one being the longest, the 3rd and 5th longer than the rest ; *clypeus* large, broad, convex, carinate, with anterior border distinctly emarginate in the centre; *frontal area* indistinctly defined; *frontal furrow* very fine; *front* with a small circular pit before median ocellus; *ocelli* small, but distinct; *eyes* somewhat prominent; *antennæ* of medium length, *scape* with slight outstanding hairs, when bent back reaching beyond margin of head by about one-fourth of its length; *funiculus*, 1st joint longer and slightly broader than 2nd, 2nd–11th increasing in length and breadth, last joint about as long as the two preceding taken together; *maxillary palpi* 5-jointed (the first two joints are probably fused), the 2nd (probably = 3rd) is the longest, 3rd–5th (probably = 4th–6th) decreasing in length; *labial palpi* 3-jointed (instead of 4 as is usual in *Chthonolasius*). *Thorax*: *prothorax* large, rounded, prominent, *mesothorax* round, convex, prominent, *meso-epinotal* furrow well marked, *epinotum* convex, prominent slightly higher than mesothorax when seen in profile declivity slanting and slightly concave. *Scale* high, broadest before base, slightly emarginate at apex. *Gaster* short, not broader than head, rounded at sides. Tibiæ with outstanding hairs. *Long.* 4·8 mm.

Described from 3 ☿☿ taken by Dr. Edwards at Bariloche 2500 ft., 25–28. x. 26. Type in Coll. Brit. Mus.

Camponotus (*Tanæmyrmex*) *chilensis* Spinola. 3 ♃♃, 1 ☿, Bariloche, 2500 ft., 25–28. x. 26.

Camponotus (*Tanæmyrmex*) *distinguendus* Spinola var. *morosus* Smith. 1 ☿, Chile, Concepcion, 26–28. xii. 26; 1 ♃, Bariloche, 25–28. x. 26.

LI.—*The Freshwater Crustacea of Bear Island.* By G. C. L. Bertram, B.A., from the Zoological Laboratory, Cambridge.

The following is an account of the freshwater Crustacea collected by the Cambridge Expedition to Bear Island in the summer of 1932 (Bertram & Lack (1)). To Dr. R. W. Gurney, of Oxford, are due my most sincere thanks for the identification of the specimens, and to Mr. David Lack I am much indebted for his assistance with the observations while on the island. I should also like to express my grateful thanks to Mr. Charles

Elton and Mr. J. T. Saunders for their kindness and most useful advice. Though certain remarks are here made upon the distribution of the various species, a fuller account of the freshwater ecology of the island will be found in a paper dealing with the ecology of the whole fauna to be published later.

All the species found upon the island are of comparatively wide occurrence, but there have been considerable variations in the collections brought back by different observers. The expedition of 1932, which stayed from June 20 to August 10, was the first to make an extended visit to the island and to collect over the whole of it, previous expeditions having confined their attention to limited fields in short visits of a few days' duration.

Bear Island lies in latitude 74° N. and longitude 19° E., but, in spite of its high latitude, its small size (12 miles long by 9 across) and the proximity of a northward arm of the Gulf Stream render its climate more equable than might otherwise be the case *. The ground becomes almost free from snow and the lakes are unfrozen for a period of from two and a half to three and a half months in the summer. In 1932 few lakes had thawed prior to June 20. The island is extremely barren and vegetation is almost confined to places with especially favourable local conditions. In the southern more mountainous region there are few lakes, while the northern plateau contains innumerable stretches of fresh water. There are no brackish lakes and none that can be considered to be of a relict type ; such forms as *Mysis relicta* and the Copepod *Eurytemora raboti* were not found.

The surface geology (Horn & Orvin (2)) has a great effect on both the amount of the scant vegetation and upon the hydrogen ion concentration of the lakes. The latter factor, and, in addition, the presence or absence of manuring by sea birds, are reflected in the freshwater fauna. With the exception of Ella Lake in the south, which is 143 feet deep, all the lakes are shallow (up to 20 feet, but few over 10 feet), with rocky or silt bottoms. Apart from algal films, and frequently a border of half-submerged moss, there is no rooted aquatic vegetation. The extreme range of pH′ was from 5·6 in a barren sandstone tarn to 9·6 in a lake heavily manured by sea-birds and situated upon the limestone. The pH′ of the sandstone lakes was always on the acid side of neutrality, that of those on the limestone on the alkaline. Though the pH′ was so variable, it soon became possible by experience to make an accurate estimate after inspection of the general features, these values agreeing with the colorimetric determinations made later. Bear Island thus appears to present diverse habitats, and the distribution of the species of Crustacea over the island was sporadic.

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* The following are the monthly average temperatures throughout the year in degrees Centigrade :—Jan. —9·4, Feb. —11·2, Mar. —11, April —7·6, May —2·3, June 1·7, July 4·3, Aug. 4·2, Sept. 1·9, Oct. —1·7, Nov. —6·3, Dec. —7·5.

	Richard (5), 1898.	Lilljeborg (3), 189 etc.	Elton (6), 1921.	Sig. Thor (8), 192	Bertram, 1932.
PHYLLOPODA.					
Lepidurus arcticus (Pallas)					
CLADOCERA.					
Sida crystallina (O. F. Muller)					
Daphnia pulex (De Geer)					
longispina (O. F. Muller)					
Macrothrix arctica Sars					
Acroperus harpæ Baird					
Chydorus sphæricus O. F. Muller.					
COPEPODA.					
Cyclops strenuus Fischer					
—— *gigas* Claus					
—— *viridis* (Jurine)					
—— *crassicaudis* Sars					
vicinus Uljanin					
Marænobiotus brucei (Richard)					
OSTRACODA.					
Eucypris glacialis (Sars)		×			
Candona candida O. F. Muller		×			

Below is given a summary of the various collections that have been made, together with brief notes upon the species taken in 1932.

NOTES ON SPECIES COLLECTED IN 1932.

Lepidurus arcticus.—The most widely distributed Crustacean on the island, occurring in more than half the tarns visited, and sometimes present in great abundance. Mainly littoral and bottom-living, but the larger individuals made regular excursions to the surface. Adults were not present until the first week of August. Most abundant in the more acid and more alkaline habitats, few being found in places of nearly neutral pH′ *. Never present in the larger lakes.

Sida crystallina.—One occurrence only, a single young specimen in a plankton sample from the island's largest lake (Hausvatnet).

Daphnia pulex.—Found in about one tarn in every three. Often present in great numbers of a large brown form. Well distributed, but rarely in the more acid waters.

Daphnia longispina.—Taken in only two adjacent barren tarns (pH′ 6·6). A large brown form in both, abundant in one. In neither case was *D. pulex* present.

Macrothrix arctica.—Six occurrences, four in alkaline tarns of pH′ greater than 8·8, the other two in a pH′ of 6·6.

Acroperus harpæ.—Taken once only, from one of the tarns containing *D. longispina.*

Chydorus sphæricus.—Widely distributed, and found in one tarn in every three, but less frequent in the more alkaline situations. In only two cases present with *D. pulex* and once with *D. longispina.*

Cyclops strenuus.—The second most widely distributed Crustacean, occurring in nearly half the localities visited. A slight tendency to be found in the more acid tarns. Same form as that described by Oloffson (4) for Spitsbergen.

Cyclops vicinus.—Five occurrences only, all in larger lakes of nearly neutral pH′.

Cyclops gigas.—Present in one tarn in every four. Well distributed over the whole island. Many young individuals in other tarns were almost certainly referable to this species.

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* Such statements are based on curves drawn to show the ratio between the number of times actually taken in each unit of pH′ to the total number of collections made from that unit of pH′. In all collections were made from thirty-seven localities.

Cyclops crassicaudis.—One male and one female only, from a shallow depression near the top of one of the southern mountains.

Eucypris glacialis.—Taken once only, from a shallow tarn (pH′ 9·4) with considerable marginal vegetation and very heavily manured by sea-birds. Young individuals were in this instance the sole Crustacean members of the plankton.

Candona sp. ? *candida.*—One individual, probably referable to this species, was taken late in the season. *C. candida* has previously been recorded from Bear Island, but *C. rectangulata* is the species from Spitsbergen. The scarcity of Ostracoda is remarkable.

The freshwater Entomostracan fauna of Bear Island is thus extremely scant, comprising only fifteen species, whereas that of Spitsbergen (120 miles to the northward) includes twenty-seven, fifteen of which have not been recorded from Bear Island. Of the Bear Island forms four species have not been recorded from Spitsbergen (*D longispina*, *S. crystallina*, *C. gigas*, and *C. viridis*). The significance of this difference is unknown. It may to some extent be correlated with the fact that parts of Spitsbergen, particularly at the heads of the fjords, have a much better climate than that of Bear Island, as indicated by the types of plant community (Summerhayes & Elton (7)).

The present collection includes certain species new to the island or taken on only one previous occasion. With one exception these could easily have been overlooked on account of their restricted occurrence. The exception is *D. pulex*, which in 1932 was one of the most widely distributed and abundant species of Crustacean on the island. It is of particular interest to note that it was present in very large numbers in Krillvatnet * in the south-east, a deep, much-manured lake, visited by all previous collectors. With such an observer as Lilljeborg (3) there can be no question of a wrong identification in the past, and therefore the conclusion must be reached that *D. pulex* has rapidly colonized Bear Island in recent years.

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* The literal meaning of the name is " plankton lake," " krill " being the term given to planktonic whale food.

The occurrence of the various species over the island was erratic, and six species taken were not found more than twice. Attempts have been made, with but little success, to find some correlation between the distribution of the more abundant forms and factors in their environment, *e. g.*, the amount of manuring by sea-birds (measured by estimations of the total nitrogen), the nature of the bottom, and the pH′ of the water. Some species, as mentioned above, do, however, occur more frequently in waters of a certain pH′ range.

The probability that environmental factors were limiting the distribution of the Crustacea on the island is enhanced by the observation that the number of species occurring together in any one habitat was always small. Thirteen species were taken in all, and in only fifteen per cent. of the collections were there more than three species present together. The greatest number of species taken in any one instance was five, and that in one case alone. This was a small lake whose water was neutral, slightly manured, and what in all respects might be termed an "average" lake for the island so far as the environmental factors were concerned.

Sufficient observations were made (extending from June 20 until August 10) to suggest strongly that there is no summer cycle of dominant species of Entomostraca in the freshwater lakes of Bear Island.

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LII.—*Some West African Snakes.* By H. W. Parker, B.A., Assistant Keeper, British Museum (Natural History).

During recent years the British Museum has received a number of interesting collections of Nigerian reptiles and amphibians through the interest and generosity of Mrs. H. Liddiard. The following notes concern either specimens actually collected by her, or species which were examined and compared during the determination of her collections.

Dromophis præornatus gribinguiensis Angel.

Two specimens of *Dromophis* from Jos agree closely with the eastern race described by Angel. In both there are nine upper labials, of which the fifth and sixth enter the eye, and there are constantly two anterior temporals ; the ventrals number 183 and 187 and in the only individual with a complete tail (a male) there are 133 pairs of subcaudals. Another marked distinguishing feature of these two examples is the width of the dorsal stripe on the posterior half of the body ; this marking is nearly three scales wide, whereas in typical western examples of *præornatus* it occupies but little more than one scale-row. Thus, although the Nigerian plateau is close to the previously known range of typical *præornatus* and is widely separated from the type-locality of *gribinguiensis*, the latter form occurs there and there is no indication of any transition between the two.

Aparallactus liddiardæ.

Holotype an immature (?) ♀, no. 1933.3.3.18 in the British Museum, from Jos, N. Nigeria ; collected by Mrs. H. Liddiard.

Diameter of the eye twice its distance from the oral margin and half its distance from the tip of the snout. Rostral broader than deep, the portion visible from above measuring less than half its distance from the frontal ; internasals shorter than the præfrontals ; frontal once and a half as long as broad, much longer than its distance from the end of the snout and a little shorter than the parietals ; nasal divided, in contact with the præocular ; one postocular ; temporals one plus one, the anterior separated from the postocular ; seven upper labials, the third and fourth entering the orbit and the fifth forming a suture with the parietal; first lower labial forming a suture with its fellow behind the symphysial; two pairs of chin-shields, the anterior the larger and in contact with four lower labials. Scales in 15 rows from the neck to the vent; ventrals 174: anal entire; subcaudals 45.

Pale grey above and below; the third scale-row on each side and the seven mid-dorsal rows each with a dark spot, the spots of the middle row largest and forming a narrow line which is continued forwards on to the parietal shields. A broad black collar on the nape and sides of the neck. Upper surfaces of the head darker grey, the ocular region and lip below the eye black; some black stippling on the edges of the parietal and temporal shields.

Length from snout to vent 80 mm., tail 36 mm.

The specimen is, unfortunately, rather damaged just behind the middle of the body, and from the torn intestine the undigested remains of a relatively large centipede are protruding.

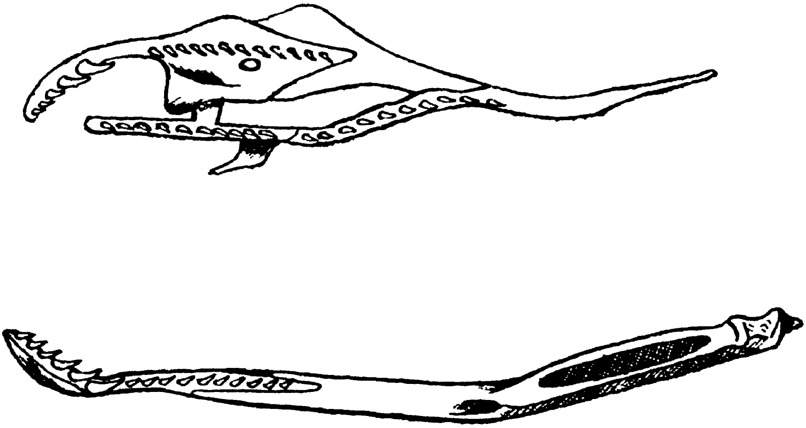
This new species appears to be most closely allied to *A. roucheti* Chabanaud, from the French Congo, but differs in the markedly higher number of ventral shields (174, instead of 139) and a rather smaller præocular. The condition of the shields on the upper surface of the head, the number of ventral and subcaudal scutes, and the colour are very similar to those of *A. bocagii* Boulenger, but the separation of the first pair of lower labials in this form seems to be a constant, valid, specific character.

OOPHILOSITUM, gen. nov.

Type-species: *Alopecion fasciatum* Gunther = *Lycophidium fasciatum* auct.

Two of the species hitherto referred to the genus *Lycophidion* Dum. & Bibr. are found to differ appreciably in dentition from the other members of the group, and these differences seem sufficiently well marked to warrant the erection of a distinct genus. The differences, which can be readily appreciated by comparing the accompanying figures, are the outcome of a reduction of the number of posterior maxillary and mandibular teeth and of the bones on which these teeth are inserted. In *Lycophidion* (seven species examined) the 6 to 10 anterior maxillary teeth increase in size posteriorly, and these enlarged anterior teeth are followed, after a distinct interspace, by 13–23 small equal teeth ; the anterior and posterior internal maxillary processes are in contact or narrowly separated and enclose a large foramen ; like the maxillary teeth, the 6–7 anterior mandibular teeth increase in size backwards and are followed, after a distinct gap by 16–22 small subequal teeth ; the dentary bone extends back to the dental foramen. In the type-species of *Oophilositum* there is the same enlargement of the six anterior maxillary and mandibular teeth, and there is also an interspace after the canine-like maxillary tooth ; but here the maxillary bone is so much shortened that the anterior and posterior internal processes have met and fused, the enclosed foramen being reduced to a mere pin-hole, and the posterior maxillary teeth are reduced to twelve ; the dentary bone, too, is reduced to about half the size of that of *Lycophidium*, there is no diastema after the enlarged anterior teeth, and the posterior teeth are reduced in number to 8 or 10.

Fig. 1.

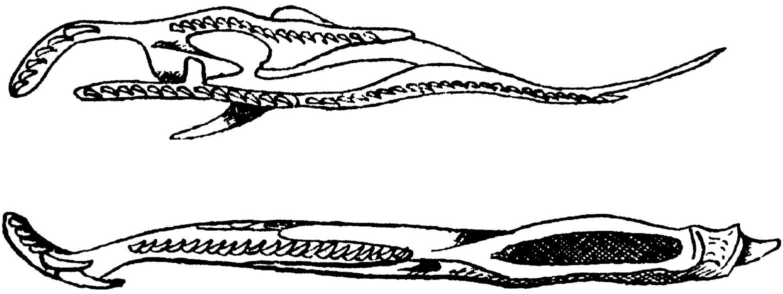


Palato-maxillary arch and mandible of *Oophilositum fasciatum* (Gunther).

M. Angel has very courteously examined the type-specimen of *Lycophidium werneri* Mocquard and reports that there are about six posterior maxillary and eight posterior mandibular teeth. The species, if it is really distinct from *fasciatum*, should accordingly be referred to *Oophilositum*.

The differences in dentition between *Oophilositum* and *Lycophidion* appear to be correlated with differences in diet. All the published records of food or stomach-contents of species of *Lycophidion* which the author has seen refer to lizards of the family Scincidæ. In addition, all the specimens in the British Museum which had food in their stomachs were found to have eaten skinks, and the rectal contents of many others were examined; in every instance skink-scales were found among the undigested remains, and never any hair or feathers. It thus seems very probable that the species of *Lycophidion* are skink-eaters and the fang-like enlarged teeth of the upper and lower jaws are certainly admirably suited to holding such hard-scaled slippery prey. Among the fifteen specimens of *O. fasciatum* which were examined, however, although the hind gut often contained fæcal matter, no scales, hair, feathers, or insect-limbs were found, but only such unexpected objects as vegetable detritus, fern sporangia, and lepidopteran wing-scales. One specimen only contained any undigested food in the stomach—two soft-shelled saurian eggs. It seems probable, therefore, that the reduced dentition is, as in some other instances, correlated with a diet of eggs; the peculiar rectal contents would be derived from the soil accidentally swallowed with the food.

Fig. 2.



Palato-maxillary arch and mandible of *Lycophidion capense* (Smith).

LYCOPHIDION Dum. & Bibr.

The species which, after examination of all except three, seem to be valid may be distinguished by the following key :—

I. Body compressed ; tail moderately long (one-fifth total length). Loreal entering the eye. (Sc. 17 ; V., ♂ 225–244, ♀ 242–253, C., ♂ 72–78, ♀ 66–70.) .... *L. elapoides* Günther.

II. Body cylindrical ; tail short (less than one-fifth total length). Loreal excluded from the eye by the præocular.

  A. Apical pits double, or more. Scale-rows 17, only rarely reduced in number before the vent.

    (1) Two to six apical pits, usually four. Two labials only entering the eye. (V., ♂ 174–192, ♀ 181–203 ; C., ♂ 43–45, ♀ 32–35.) .... *L. laterale* Hallowell.

    (2) Two, rarely three, apical pits. Three labials entering the eye. (V., ♂ 182–187, ♀ 164–189 ; C., ♂ 46–53, ♀ 30–44.) *L. irroratum* (Leach).

  B. Apical pits single. Scale-rows reduced in number before vent.

    (1) Maximum number of scale-rows 19. Two labials only entering the eye. (V. ♀ 190, C. ♀ 45.)............... *L. polylepis* Boulenger.

    (2) Maximum number of scale-rows 17 (abnormally 16). Three labials entering the eye.

      (*a*) Parietals not much longer than the distance between the frontal and the end of the snout. (V., ♂ 188–200, ♀ 200–219 ; C., ♂ 47–55, ♀ 34–43.) .... *L. semicinctum* Dum. & Bibr.

      (*b*) Parietals much longer than the distance between the frontal and the end of the snout.

        (i.) Nostril in a single nasal ; a small postnasal ; ventrals, ♂ 163–198, ♀ 166–208 ; C., ♂ 32–48, ♀ 22–39.

          (α) A broad, ∩-shaped, salmon-pink band around the snout . *L. capense uzungwense* Loveridge.

          (β) No light band round the snout, or only a narrow one .... *L. capense capense* (Smith).

        (ii.) Nostril in a semi-divided nasal ; no postnasal. Ventrals, ♀ *, 140–156 ; C., ♀, 18–28.) .... *L. acutirostre* Günther.

    (3) Maximum number of scale-rows 15. Three labials entering the eye. (V. 153–180 ; C. 23–32.) .... *L. meleagre* Boulenger.

  C. No apical pits. Scale-rows 17, reduced before the vent. Nostril in a single entire nasal ; no postnasal. (V., ♀, 146 ; C., ♀, 30.)........................ *L. semiannule* Peters.

The " male " type was wrongly sexed.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[TENTH SERIES.]

No. 72. DECEMBER 1933.

LIII.—*A further Contribution to the Study of South African* Scelionidæ (*Insecta, Hymenoptera, Proctotrupoidea*). By G. E. J. Nixon, B.A.

[Concluded from p. 479.]

LAPITHOIDES, gen. nov.

Head transverse. Frons evenly convex. Cheeks not strongly produced backwards. Eyes with minute, scattered hairs. Posterior ocelli almost touching the eye-margin. Antennæ 12-segmented. Mandibles with three teeth of nearly equal size and length.

Thorax not much longer than high. Mesonotum evenly convex, without a specialized area in front. Shoulders of the pronotum hardly visible from above. Parapsidal furrows entirely absent. Postscutellum with a transverse, lamelliform process, which is shorter than the scutellum and is directed more or less upwards. Fore-wings with the subcostalis taking a distinct downward curve before reaching the marginalis, so that the wing-membrane is clearly visible above the former ; marginalis about twice as long as wide, shorter than the stigmalis ; postmarginalis apparently about three times as long as the stigmalis, but actually false over its greater length ; the chitinized part of the postmarginalis is but little longer than the marginalis.

Abdomen narrow, considerably longer than wide, strongly narrowed towards its base ; tergite 1 not transverse and without pit-like impressions on each side at its base; 2 nearly twice as wide apically as basally; this segment has a transverse impression at its extreme base, but owing to the transparency of the tergite it is not sharply defined; 3 not longer than 2.

Type of the genus, the following species:—

Lapithoides semiramis, sp. n.

♂.—Head clear honey-brown. The eyes black. Each ocellus is set in a black spot; in one specimen, the anterior ocellus is connected with each of the posterior ocelli by a blackish band. A large blotch on the front of the mesonotum is blackish; the posterior half of the thorax is more or less suffused with blackish; the scutellum is blackish with a pale spot on each side; the thorax otherwise, and the legs are more or less honey-brown. Tergites 1, 2, and 3 in greater part transparent honey-yellow.

Head, seen from above, nearly one and a half times as wide as long. Frons in greater part smooth and shining. Vertex in the region of the ocelli very finely scaly-reticulate, and with minute, scattered, indistinct punctures. Cheeks very delicately striated. Posterior ocelli separated from the eye-margin by about their own diameter. Eyes sparsely clothed with very short, hardly visible hairs. Antennæ: scape a little shorter than the following three segments together; pedicel more or less spherical; funicle long and cylindrical; segment 1 nearly two and a half times as wide as long; 2 hardly two-thirds as long as 1; 3–9 all a trifle longer than 1; the funicle is thickly clothed with short, semi-erect, somewhat bushy hairs; these hairs are not all of equal length, but many of them are nearly as long as the width of the segments. Mandibles with three teeth, the middle one smaller than the other two, but quite distinct.

Thorax: Mesonotum weakly shining and with a sculpture more or less similar to that of the vertex, especially at the sides and behind. Scutellum sculptured more or less like the mesonotum. The length of the postscutellar process is hardly half that of the scutellum; it is pointed at its apex, and each of its sides is weakly angled behind the middle, so that it appears to be more or less three-cornered. Propodeum with its entire surface covered with moderately coarse rugosities; its posterior surface is not distinctly excavated, nor is it smooth; the usual carinæ, which limit the posterior propodeal surface, are distinct in one specimen, but only weakly indicated in the other two. The small area on the lower part of the mesopleuræ and in front of their smooth impression is coarsely and irregularly punctate. Fore-wings (see Pl. XI. fig. *f*) large, extending well beyond the apex of the abdomen; marginalis considerably shorter than the stigmalis; the limits of the postmarginalis are difficult to define; when the wing is seen from beneath, however, it appears to be fully three times as long as the stigmalis; a chitinized basal nervure is weakly indicated; the fringe is long, and bristle-like hairs arise from the subcostalis, marginalis, and the postmarginalis. Legs long and slender; segment 1 of the hind tarsus as long as the following segments together.

Abdomen slightly narrower than the thorax, nearly three times as long as wide; segment 1 about as long as its apical width, striated and without impressions on each side at its base; 2 nearly twice as wide apically as basally; 3 about as long as 2; 2 and 3 delicately striated everywhere except along the extreme lateral margins; 3 and 4 together a little longer than 2, which is transverse; 4, 5, and 6 slightly shining, and with an extremely faint, indefinite sculpture.

Length about 1·9 mm.

ORANGE FREE STATE (Harrismith, *Feb.*), 3 ♂♂.

The species is of delicate slender build. Especially characteristic features of it are the comparative smoothness of the mesonotum combined with complete absence of parapsidal furrows and with the structure of the post-scutellar process.

Lapithoides is closely related to *Lapitha* Ashmead, but the writer is of the opinion that the two genera can be separated quite naturally if the presence of a specialized mesonotal area is consistently regarded as a character of generic value.

Specimens of *spinosa* Ashmead, the genotype of *Lapitha*, bearing identification labels in Ashmead's own handwriting are in the collection of the British Museum. An examination of this material has enabled the following conclusions to be drawn:—*Lapithoides* differs from *Lapitha* only in that it possesses no trace of a specialized mesonotal area, and has the postscutellum produced medially in the form of a transverse process instead of into a single spine. *Lapitha* has a very distinct specialized area at the front of the mesonotum, but, owing to the pale colour of the thorax, it is not readily visible. Although Ashmead says that *spinosa* has parapsidal furrows indicated in front, the specimens in the British Museum (all males) reveal hardly a trace of them.

Ashmead, and Kieffer following him, fails to mention that *spinosa* has the eyes thickly clothed with very short, but quite distinct, hairs. This may have been the reason why Dodd placed his three species (*divina*, *javanica*, and *citreicoxa*) in this genus, for all of them have bare eyes. They possess, further, no trace of a specialized mesonotal area and have, too, a postscutellar process which more nearly approaches the form of that found in *Lapithoides semiramis*, sp. n., than the spine of the postscutellum of *Lapitha spinosa* Ashm. These three species of Dodd would therefore be better placed in the former genus than in the latter if the presence of hairs on the eyes is not regarded as being of generic importance in this case.

PARANTERIS Kieffer.

Paranteris Kieff. Bull. Soc. Ent. France, p. 292 (1910).

The genus is closely related to *Ceratoteleia* Kieff., from which only its having distinctly hairy eyes separates it satisfactorily.

As Kieffer's key to the species and his descriptions of them are so inadequate and misleading, they are tabulated again here, a short diagnosis also being added in most cases.

The thought which prompted the undertaking of this revision has been a happy one, for an examination of the type-material in the B.M. collection has revealed a female of *nitidiceps* Kieff. (hitherto unknown) hidden among the examples of *nigraticeps* Kieff.

The species reviewed here include a new insect from S. Africa and the five species from the Seychelles Islands. None of the following remarks, however, refer to *Paranteris opacus* Kieff., from Brazil, a species with which the author is not acquainted.

The species of *Paranteris* have the wings conspicuously hairy; the fringe is long, and long bristle-like hairs arise from the subcostalis; a little beyond its mid-point the subcostalis takes a distinct downward curve before reaching the marginalis, so that apically it is well separated from the edge of the wing; the marginalis is somewhat thick, and is never more than about one and a half times as long as wide; the postmarginalis varies in length, even within a species, but is never much longer than the stigmalis.

Key to the Species of Paranteris.

Females.

1. Postscutellum, medially, more or less bidentate. Posterior ocelli separated from the eye-margin by at least their greatest width .... 2.

Postscutellum, medially, simple. Posterior ocelli separated from the eye-margin by a distance usually markedly less than their greatest width. (Species with segment 2 of the funicle conspicuously longer than wide and fully, or but little less than, twice as long as 3; tergite 6 strongly transverse, but distinctly triangular in outline.)........ 4.

2. Tergite 1 a little longer than wide; 3 not distinctly transverse .... *tenuis*, sp. n.

Tergite 1 not longer than wide, 3 distinctly transverse .... 3.

3. Parapsidal furrows indicated only posteriorly; the abdomen not extending beyond the apex of the wings .... *densiclava* Kieffer.

(A small, stout species, 1·5 mm. approx., the frons and the vertex with a very faint scaly-reticulate sculpture. Segment 2 of the funicle not longer than wide. Teeth of the postscutellum small and wide apart. Tergite 6 very strongly transverse, and by no means distinctly triangular in outline, the abdomen, in consequence, appearing more or less rounded at its apex. In general facies approaching very closely to the African species of the genus *Paratrimorus.*)

Parapsidal furrows complete; the abdomen extending beyond the apex of the wings.... *nitidiceps* Kieffer.

(Hitherto undescribed: *Head* black, rest of body honey-brown. Frons and vertex smooth and shining, more or less unpunctured, clothed with upstanding, scattered, bristle-like, brownish hairs. Segment 2 of funicle about one and a half times as long as wide. Shortest distance between the eyes on the frons considerably greater than their width; posterior ocelli separated from the eye-margin by considerably more than their greatest width. *Mesonotum* shining, with small punctures, which are separated from each other mostly by much more than their diameter; spaces between the punctures entirely smooth. Parapsidal furrows represented by smooth narrow grooves, which are slightly clavately widened posteriorly. Postscutellar teeth small and wide apart. Propodeum deeply excavated, but the excavation not entirely smooth. Fore-wings with the postmarginalis as long as the stigmalis. *Abdomen* regularly spindle-shaped, with tergite 1 distinctly transverse; this tergite has on its basal portion a swelling which, when seen from the side, does not project backwards as a horn, and hence does not completely fill the propodeal cavity; the ridges on this segment are irregular and wide apart; 3 smooth, except for faint longitudinal flutings and some punctures at the sides; 4 and 5 with small scattered punctures; 6 transverse, very sharply constricted before its apex, on its apical half dull, finely rugose, the sculpture contrasting with that of the preceding segments. This species could be confused only with *tenuis* and *densiclava* on account of the post-scutellar teeth, but from both of these species it is readily distinguished by the absence of sculpture on frons and vertex and by the form of the 1st and the 6th tergite.)

4. The shortest distance between the eyes on the frons not less than their width. Frons and vertex smooth and shining and with very small, sharply defined punctures, which are not very close together. Parapsidal furrows indicated only posteriorly .... [=*striatigena* Kieff.*. *nigraticeps* Kieff.

(A species with a black head and a brown body, the head clothed with short, brownish, semi-erect hairs. Postmarginalis feebly developed. Tergite 3 finely to very faintly striated; tergites 4 to 6 finely punctate.)

The shortest distance between the eyes on the frons much less than their width. Frons and vertex not smooth and shining. Parapsidal furrows complete, sharply defined, and narrow .... 5.

(Species with brown head and body and with tergite 3 entirely smooth and tergites 4–6 feebly and indistinctly punctate.)

5. Shortest distance between the eyes about half the width of the eyes themselves. Funicle more or less brownish black .... *nigriclava* Kieffer.

(A species with the head clothed with fine, not conspicuous, whitish pubescence. Almost the entire frons very finely rugose, almost chagrined, the sculpture slightly coarser on the vertex. Paired ocelli virtually touching the eye-margin. Mesonotum dull, the surface scratched between the small punctures, which are close together and ill defined, especially anteriorly, where the surface becomes rugose.)

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* *P. striatigena* Kieff., represented by a single female, is quite definitely synonymous with *P. nigraticeps* Kieff.

Shortest distance between the eyes a little less than the width of the eyes themselves. Funicle entirely honey-yellow .... *flaviclava* Kieffer.

(A species with the head clothed with more or less upstanding, brownish hairs, which are very short and somewhat stiff. The frons distinctly punctured, the punctures rather small, but ill-defined, close, and the surface between them scratched. Paired ocelli separated from the eye-margin by about their shortest width. Mesonotum, at least on its posterior two-thirds, shining, the surface more or less smooth between the punctures.)

Males.

1. Posterior ocelli separated from the eye-margin by a distance greater than, or as great as, their greatest width .... 2.

Posterior ocelli separated from the eye-margin by a distance smaller than or hardly as great as, their greatest width........... 3.

(Species with the segments of the funicle conspicuously cylindrical, fully three times as long as wide, clothed with dark, very short, semi-erect hairs, most of which are curved at their apex so that they have a somewhat tangled appearance.)

2. Postscutellum medially bidentate, the teeth very small and wide apart. Frons and vertex entirely smooth and shining .... *nitidiceps* Kieff.

(A species with the head black, the rest of the body brown, the head clothed above with short, irregular, upstanding hairs. Segments of the funicle about one and a half times as long as wide; hairs of these segments very short, stiff, bristling, each one standing out more or less separately.)

Postscutellum medially with a row of three or four shallow pits. At least the vertex considerably sculptured .... *tenuis*, sp. n.

3. Frons smooth, shining, with small well-defined punctures .... *nigraticeps* Kieff.

(In the region of the ocelli the surface tends to become scratched between the punctures, producing a dull appearance.)

Frons dull, apparently extremely finely rugose. *nigriclava* Kieff.

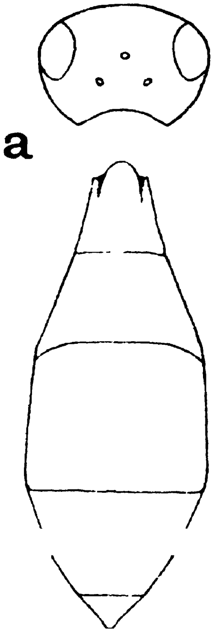
(Sculpture of the frons and the vertex less strong than in the female; minute close punctures can be detected, but their edges are very ill defined, and the spaces between them are scratched or scaly-reticulate. The eyes are not so large nor so close together. The sculpture of the mesonotum is less dull, especially posteriorly, where, owing to a reduction of the fine surface-sculpture, the spaces between the punctures are almost smooth. The whitish pubescence of the head is hardly visible, except perhaps on the temples.)

Paranteris tenuis, sp. n. (Text-fig. 10.)

♀.—Black, but not deep black. Scape and pedicel brownish-black. Legs honey-brown, the coxæ sometimes darker. Abdomen sometimes blackish-brown. The whole insect is conspicuously hairy, the hairs being brownish, semi-erect, and uneven.

Head about one and a half times as wide as long, its shape distinctive; when viewed by looking down directly on to the ocelli it is seen to be strongly narrowed behind; the shining occipital area is extended high up towards the ocelli, so that the shortest distance between the occipital margin (on the vertex) and either of the paired ocelli is about equal to the distance between these ocelli. The head is, in greater part, entirely smooth, shining, and unsculptured, except for scattered inconspicuous punctures which are most numerous on the frons; vertex in the region of the ocelli, and the vertex behind the ocelli with extremely fine scale-like reticulations; this sculpture

Text-fig. 10.



Paranteris tenuis, sp. n., ♀.
a, head from above; *b*, abdomen.

sometimes extends downwards over the temples; there is usually a small unsculptured space on the middle of the vertex against the occipital margin. Cheeks between the mandibles and the eyes finely and evenly striated. Antennæ: scape nearly as long as the following six segments together; segment 1 of the funicle about one and three-quarters times as long as wide; 2 hardly shorter; 3 and 4 very small, bead-like; 5–10 forming a thick club. Eyes unusually small, the distance between them, across the frons, much greater than their width, clothed with rather long hairs, which are moderately close together. Posterior ocelli separated from the eye-margin by a distance about equal to that separating them from the anterior ocellus. Mandibles with three teeth.

Thorax: Mesonotum in greater part smooth and shining with scattered, irregular punctures; anteriorly the mesonotum becomes much less smooth, owing to the surface being scratched between the punctures, which now appear less distinct than on the shining median and posterior surface of the mesonotum. Parapsidal furrows showing as more or less smooth, but somewhat irregular, grooves; often the surface along the outer side of the furrows is scratched between the punctures. Scutellum more or less smooth medianly, but margined with irregular crenulations and punctures. Postscutellum with its posterior edge slightly produced medially and widely emarginate, hence appearing weakly bidentate. Fore-wings (see Pl. X. fig. *b*) extending to about the apex of tergite 4, considerably narrower than the abdomen; fringe rather long; hairs along the subcostalis long and conspicuous; the subcostalis takes a downward, very gradual curve before reaching the marginalis; marginalis almost punctiform; stigmalis somewhat short, describing between itself and the wing-edge an angle of rather more than 45°; postmarginalis wanting or weakly indicated. Legs with segment 1 of the hind tarsus about as long as the following segments together.

Abdomen nearly three times as long as the visible dorsal surface of the thorax; tergite 1 elevated basally and produced backwards over the propodeum to as far as the postscutellum; this tergite, inclusive of the horn, is a little longer than its apical width; the apex of the horn is smooth and shining; at the base of the horn and at about the mid-point of the segment there is a short sharp tooth which is directed towards the apex of the abdomen; tergite 1 is otherwise longitudinally striated, the striæ somewhat irregular, not very close, the intervals between them with weak transverse rugulosities; tergite 2 about one and a half times as wide apically as basally, longitudinally striated all over; 3 about one and three-quarters times as long as 2, hardly transverse, in greater part smooth and shining, but with some very delicate striae towards the sides; following tergites shining and finely punctate; tergite 6 pointed, but transverse; there is no trace of an angulation between it and the preceding segment.

Length 1·9 mm.

The male differs from the female in the following respects:—

Head slightly more transverse. Antennæ blackish-brown, extreme base of scape paler; scape about as long as the following three segments together; pedicel short and bead-like, smoother, much less hairy, and less thick than segment 1 of the funicle; funicle rather thick, shining, clothed with short, semi-erect, brownish hairs; many of these hairs are more or less curved at their tip; there are no adpressed hairs among them; segment 1 about one and three-quarters times as long as wide, twice as long as the pedicel; following segments slightly shorter, but all conspicuously longer than wide.

Thorax: Postscutellum with its medial area not emarginate apically; this area consists of three or four shallow pits arranged in a row. Propodeum coarsely rugose and with two strong longitudinal carinæ. Fore-wings extending to the apex of the abdomen and hardly narrower than the abdomen.

Abdomen. Tergite 1 a little longer than wide, longitudinally striated all over and without a conspicuous impression on each side at its base. Tergites 2 and 3 tend to become paler than the rest of the abdomen.

Length 1·7 mm.

CAPE PROVINCE (Somerset East, *Dec. & Jan.*), 9 ♀♀, 4 ♂♂. CAPE PROVINCE (Port St. John, *Mar.*; Aliwal North, *Dec. & Jan.*), 4 ♀♀. ORANGE FREE STATE (Harrismith, *Mar.*), 1 ♂.

One of two females from Aliwal North shows slight differences from typical specimens, but the writer does not consider that these differences lie outside the range of specific variation.

In the female in question the vertex shows no scaly-reticulate sculpture, but is very shining and has scattered punctures of very irregular shape. In the fore-wings there is present a postmarginalis, which is very slightly longer than the stigmalis. Tergite 1 of the abdomen, when seen from the side, has no sharp tooth medially, there being only a somewhat abrupt angulation between the base of the horn and the remaining flat surface of the segment.

The other female from Aliwal North is quite typical.

This species is characterized by the position of the posterior ocelli, the small eyes, the distribution of sculpture on the head and the thorax, and, further, in the female, by the presence of the tooth on the 1st abdominal tergite.

The medial emargination of the postscutellum is regarded as a secondary sexual character, since it does not occur in the male. It is doubtless a necessary modification to accommodate the intruding apex of the abdominal horn.

According to Kieffer's table of genera this insect would fall into the genus *Anteris* Forst., on account of the ocelli being remote from the eye-margin. But this character associated with the position of the posterior ocelli has hardly more than specific value, as is shown by an examination of the species of *Paranteris* Kieff. *P. tenuis*, therefore, can be quite naturally placed in the latter genus.

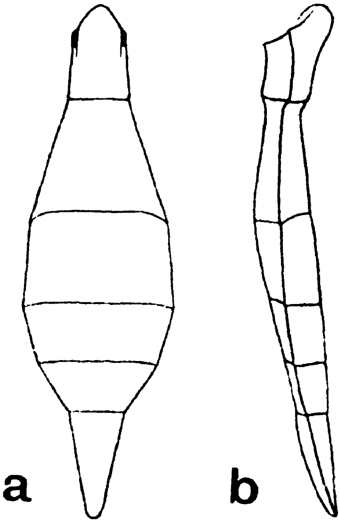
Ceratoteleia aphrodite, sp. n. (Text-fig. 11.)

♀.—Entirely black, including the antennæ. Extreme base of the scape and of the pedicel and the mandibles brownish-yellow; the mandibles become reddish towards the tip. Legs dirty brownish-yellow, the hind femora darker.

Head once and a half times as wide as long, seen from above, very slightly wider behind the eyes than across them. Face immediately above the antennal insertions evenly convex and medially more or less smooth and shining. Frons and vertex quite dull, very finely rugose;

along the inner eye-margins, down to the somewhat indistinct genal sulcus and on the temples, the sculpture becomes finer and appears to be finely scaly-reticulate. Cheeks smooth and shining. Antennæ : scape somewhat short, as long as the following three segments together ; pedicel no wider than segment 1 of the funicle, nearly twice as long as its apical width ; segment 1 of funicle about twice as long as its apical width ; 2 hardly longer than wide; 3 and 4 still smaller, bead-like ; 4 transverse ; these two segments together about equal to 1 ; segments 5–9 transverse, with 10, forming a moderately thick club. Posterior ocelli touching the eye-margins. Eyes clothed with scattered, extremely short, inconspicuous hairs ; distance between the eyes across the frons greater than the width of the eyes themselves. Mandibles with two more or less equal teeth of moderate length.

Fig. 11.



Ceratoteleia aphrodite, sp. n., ♀.
Abdomen . *a*, dorsal ; *b*, lateral.

Thorax a little narrower than the head. Mesonotum dull, sculptured like the vertex ; anteriorly, against the pronotum, the mesonotum has no specialized area. Parapsidal furrows represented by two very fine, somewhat inconspicuous grooves. Scutellum transverse, strongly shining, smooth, and with a few small scattered punctures. Postscutellum with its posterior edge straight and not projecting medially, as a lamella, over the apex of the abdominal horn. Propodeum deeply excavated to receive the horn of tergite 1. Pleuræ in greater part smooth and shining. Fore-wings (see Pl. X. fig. *c*) smoky-grey, narrow, two-thirds as wide as the abdomen, extending to nearly the middle of tergite 5 ; subcostalis running so close to the edge of the wing as to be almost confused with it ; marginalis but little longer than wide ; post-marginalis about as long as the stigmalis. Legs slender ; fore and middle tibiæ spinose in front, the spines very short and tooth-like ; segment 1 of the hind tarsus a little longer than the following segments together.

Abdomen spindle-shaped, strongly narrowed at its base, almost petiolate, wider than the thorax, and between three and four times as long as the visible dorsal surface of the thorax ; tergite 1 elevated at its base and produced backwards over the propodeum to as far as the postscutellum, including the horn nearly twice as long as wide ; except for the smooth apex of the horn, this tergite is regularly and closely striated ; 2 fully twice as wide apically as basally, smooth and shining, striated at its base, the striæ longest medially, where they extend about two-thirds the length of the tergite ; 3–5 smooth and shining ; 4 and 5 together a little longer than 3 ; tergite 6 narrow, about two and a half times as long as its basal width, shining and smooth except for some very delicate longitudinal striations ; owing to the narrowness of this tergite there is a conspicuous angulation between it and tergite 5. The abdomen is clothed with fine inconspicuous hairs towards its apex.

Length 2·5–3 mm.

CAPE PROVINCE (Somerset East, *Jan.*), 2 ♀♀.

This species has an obvious and natural affinity with *C. mellicolor* Nixon. The general facies is the same, although *aphrodite* is a slenderer insect than *mellicolor* ; the venation is identical in the two species. The absence of a small median tooth between the two teeth of the mandibles and the presence of fine hairs on the eyes in *aphrodite* cannot be regarded as having generic importance. As a species *C. aphrodite* admits of no confusion with *C. mellicolor* ; in addition to the two characters just mentioned, the former insect differs in its entirely black body, its spinose fore and middle tibiæ, and in the much more striking contrast provided by the entirely dull mesonotum and the highly polished scutellum.

Ceratoteleia mellicolor Nixon.

♂ (hitherto undescribed).—In greater part honey-brown. The head is entirely black. The mesonotum, scutellum, and tergites 4, 5, and 6 more or less brownish-black. Legs brownish. The insect is long and narrow.

Head about one and three-quarter times as wide as long, dull; when seen from above, it is evenly oblong, does not appear at all emarginate behind, and hence gives no impression of being crescent-shaped. The frons, except for a moderate-sized area above the antennal insertions, which is nearly smooth, the vertex and the temples, very finely rugose all over. Cheeks less dull than the vertex, but still finely rugose and without a trace of striation. Eyes sparsely clothed with minute, inconspicuous hairs. Ocelli separated from eye-margin by about their own diameter. Antennæ: scape a little shorter than the following three segments together; segment 1 of the funicle about one and three-quarter times as long as wide; 2 a little shorter; following segments to 11 about one and a half times as wide as long; 3 slightly thicker than the other segments and weakly excavated on its basal two-thirds; the hairs of the funicle are rather more than half the width of the segments, and are nearly erect, bristle-like, and very regular—that is to say, nearly every hair stands out separately. Mandibles with two rather short teeth.

Thorax distinctly elongate. Mesonotum more or less dull, with an irregular scaly-reticulate sculpture, which gives it the appearance of being extremely finely rugose. Parapsidal furrows clearly defined as two narrow grooves. Scutellum smoother and more shining than the mesonotum. Postscutellum showing medially as a short, strongly transverse process, the posterior edge of which is straight and very slightly lamelliform. Propodeum with its posterior surface shallowly excavated, the limits of the excavated area defined by two very distinct ridges which extend from the posterior propodeal corners and converge towards a point, distant from the postscutellum by about the length of the postscutellum, and from which point they run more or less parallel to the posterior margin of the postscutellum itself. Wings extending to about the apex of the abdomen.

Abdomen three times as long as wide, strongly narrowed at its base, almost petiolate; segment 1 about one and a half times as long as its apical width; 2 about two and a half times as wide apically as basally, smooth except for striations at its base, which are longest medially; segments 3–7 smooth and shining; 3 transverse; 4, 5, and 6 together a little longer than 3.

Length 1·9 mm.

CAPE PROVINCE (Somerset East, *Jan.*), 1 ♂.

The writer has no hesitation in associating this male with the previously described female, in spite of slight differences, such as the presence of minute hairs on the eyes and the possession of only two teeth to the mandibles. The first of these details is regarded in the light of a secondary sexual character, the other as a slight variation well within the limits of the variation of the species, since the middle mandibular tooth in the female is much smaller than the other two, and may well be expected to disappear in some individuals.

EXPLANATION OF THE PLATES.

PLATE X.

Fig. a. *Vardhana selene*, sp. n. Fore wing.
Fig. b. *Paranteris tenuis*, sp. n. Fore wing.
Fig. c. *Ceratotelcia aphrodite*, sp. n. Fore wing.
Fig. d. *Govinda mila*, sp. n. Fore wing.

PLATE XI.

Fig. e. *Duta tenuicornis* Dodd subsp. *fragilis*, subsp. n. Fore wing.
Fig. f. *Lapithoides semiramis*, sp. n. Fore wing.
Fig. g. *Gita infortunata*, sp. n. Fore wing.
Fig. h. *Govinda nona*, sp. n. Fore wing.

LIV.—*A new Galerucine Beetle from China.*
By S. MAULIK.

THE insects on which the following description is based were sent to me by Professor P. H. Tsai, of the University of Chekiang.

Platyxantha chinensis, sp. n.

Body oblong, with the apex rounded. Elytra and scutellum blue-black, in certain lights the elytra show violet iridescence; eyes and upper surface of the vertex of head black; upper surface of antennal segments blackish, the colour being stronger on the basal segments than on the apical; underside blackish; legs, prothorax, head yellow or light brown. *Head* exserted, with the vertex impunctate; interantennal ridge sharply raised; elevated portions on the interocular area moderately raised; labrum large, completely covering the mandibles, broader than long, widely rounded in front. Eyes moderately convex. Antenna long, extending nearly to the apical area of the elytron; first segment club-shaped, being much thicker towards the apex; second small, rounded; third to sixth similar, third slightly longer than fourth, fourth and fifth equal, sixth being shorter than fifth; seventh to tenth similar in structure and equal to each other in length; eleventh longer than tenth and acutely pointed at the apex. *Prothorax* quadrate, narrowed at the base, so that the front is broader than the basal margin; front and basal margins almost straight; sides obliquely straight, the lateral margins very narrowly and sharply reflexed; upper surface sloping down on each side in front, shagreened, with a shallow depression on each of the longitudinal middle lines, the depressions being nearer the base, very sparsely covered with fine but well-impressed punctures. *Scutellum* large, triangular, with the apex broadly rounded and the surface finely shagreened. *Elytra* slightly broader at the base than the prothorax; humerus prominently raised; basal area gently convex; surface shagreened and confusedly punctate, some of the punctures being finer than others; the surface shows at certain angles an indefinite uneven character. *Underside* smooth, sparsely covered with fine hairs. *Legs* slender, long; claws appendiculate.

Length 5·75 mm.; breadth a little more than 2 mm.

CHINA: Hangchow, 23. iv. 1933 (*Prof. P. H. Tsai*).

Described from thirty examples.

Type in the British Museum.

LV.—*On new Indian* Curculionidæ (*Col.*).

By Sir Guy A. K. Marshall, C.M.G., F.R.S.

Subfamily *Brachyderinæ.*

Leptomias mundali, sp. n.

♂♀. Derm black, with sparse separated brown scales (usually with a slight metallic reflection) which are denser on intervals 5–7 and towards the apex.

Head finely punctate and with oblique wrinkles on each side (especially in ♀), the median sulcus deep and extending back as far as the hind margin of the eyes or beyond. *Rostrum* longer than broad, gradually narrowing from the base to the antennæ, widening slightly at the genæ, shallowly impressed in the basal half in ♀ but flat in ♂; the dorsum punctate and more or less wrinkled longitudinally, with a deep median sulcus and a curved stria on each side of it which is usually subcarinate on its inner edge, the dorsal margins rounded. *Antennæ* red-brown, with the club fuscous; funicle with the two basal joints equal, all the others longer than broad but 7 wider than the rest, 4–6 equal, 3 very slightly longer. *Prothorax* as long as broad, moderately rounded at the sides, widest at the middle and nearly as wide at apex as at base in ♂, widest slightly behind the middle and narrower in front in ♀, without any basal constriction; the dorsum with more or less contiguous flattened punctate granules in the middle, which become more convex laterally, and a deep complete median sulcus. *Elytra* narrow and elliptical in ♂, much broader in ♀, shallowly sinuate and marginate at the base, jointly rounded at the apex, the dorsal outline quite flat from the base to the declivity in ♂, slightly convex in ♀, without dorsal impressions; the striæ with deep punctures, stria 3 not curving outwards at the base, 8 deeply impressed behind the middle (especially in ♀); the intervals scarcely broader than the striæ in ♂, broader in ♀, 3 and 5 sometimes slightly more convex than the others; the scales very small and not contiguous, the setæ minute or absent on the disk, short and erect on the declivity, being longest on interval 1. *Legs* with the front femora more swollen; the front tibiæ shallowly sinuate on the dorsal edge (less so in ♀) and somewhat incurved at the apex; the hind tibiæ of ♂ straight externally, compressed and not denticulate internally on the apical half, the corbel produced strongly inwards without any tuft of setæ, its apical edge at right angles to the main axis; the middle coxæ of ♂ with a small projection.

Length, ♂ 6·5, ♀ 6·5–7·5 mm.; breadth, ♂ 2·5, ♀ 3·0–3·7 mm.

UNITED PROVINCES: Mundali, Chakrata, 1 ♂, 2 ♀♀, 29. vi. 1933 (*H. M. Bhatia*).

Belongs to the group in which the two basal joints of the funicle are equal and the male bears projections on the middle coxæ. This has hitherto comprised only two species, the males of which (the only sex known to me) may be distinguished as follows:—*L. longulus* Fst., 1897, has a long tuft of setæ in the corbels of the hind tibiæ, the front tibiæ are not sinuate dorsally, the prothorax is longer than broad and more narrowed in front. *L. curvipes* Mshl., 1916, has the hind tibiæ distinctly curved externally, not compressed, and granulate internally; the prothorax is globose, widest behind the middle, more narrowed in front, and has a distinct constriction just before the base.

Subfamily HYLOBIINÆ.

Pagiophlœus umbricidus, sp. n.

♂♀. Red-brown, the elytra usually paler and with variable blackish markings; some elongate spots towards the base of intervals 2, 3, and 5, a short stripe running backwards from the shoulder on 7 and 8, an elongate patch in stria 1 a little before the middle, a stripe from the middle of interval 7 or 8 running obliquely backwards to the top of the declivity on interval 2, and a large quadrate subapical patch on 5–9; entirely devoid of scaling.

Head with confluent punctation and a shallow frontal fovea (sometimes obsolete), the supra-ocular furrow immediately adjoining the eye. *Rostrum* slightly longer than the pronotum, with coarse confluent punctation without any median carina and with two punctate sulci on each side. *Antennæ* with the two basal joints of the funicle subequal, 3 as long as broad, 4 and 5 transverse and equal. 6 broader and with sparse pubescence, 7 more transverse, still broader and with denser pubescence.

Prothorax slightly broader than long, gently rounded laterally, widest behind the middle, feebly constricted at the base and near the apex; the base shallowly bisinuate, the apex truncate or slightly arcuate, the post-ocular lobes very feeble; the dorsum with coarse confluent punctation and an abbreviated median carina, the interspaces often subgranulate. *Scutellum* flat, about as long as broad, indistinctly punctate, thinly pubescent. *Elytra* parallel-sided from the roundly rectangular shoulders to beyond the middle, the apices separately pointed; the striæ shallow on the basal half and containing quadrate foveæ, much deeper behind and there set with small shallow punctures; the septa between the foveæ on the disk as broad as the intervals, which are set with small depressed granules and short recumbent golden setæ; interval 10 not impressed near the base. *Metasternum* coriaceous and with very large punctures at the sides, shiny and with small sparse punctures in the middle.

Length 7·5–9·5 mm.; breadth 3·0–4·0 mm.

Mysore: Kadumane, 6 ♂♂, 3 ♀♀, x. 1932.

This species has been received from three different sources, but the specimens appear to have all emanated from the same estate, on which the weevil has done serious damage by killing large numbers of *Grevillea*-trees used as shade for tea.

The species is nearly allied to *P. macilentus* Boh., 1834, and *P. fletcheri* Mshl. (Bull. Ent. Res. ix. 1919, pl. xvii. fig. 1), which it closely resembles in general facies, but both these insects differ in having the rostrum more or less distinctly 5-carinate; the head bears finer non-confluent punctures and a deep median fovea, and the supra-ocular furrow is separated from the eye by a narrow rim; the prothorax is parallel-sided in the basal half, and interval 10 bears a rounded impression at about one-third from the base. *P. macilentus* differs also in having the rostrum and antennæ much stouter, and joint 3 of the funicle transverse.

Subfamily *Nanophyinæ*.

Diplophyes, gen. nov.

The species for which this new genus is proposed presents the general appearance of a *Nanophyes*, but in one particular it is intermediate between that genus and *Ctenomerus* owing to a remarkable form of sexual dimorphism, the male having a 5-jointed funicle, whereas that of the female is 6-jointed. It differs, however, from both these genera in having only two apparent separated joints in the antennal club (instead of three), the external basal angles of the elytra are not produced, and stria 10 is complete and not effaced in the middle.

Genotype : *Diplophyes shoreæ*, sp. n.

Diplophyes shoreæ, sp. n.

♂♀. Derm red-brown ; the rostrum, antennæ, and legs pale testaceous ; the head, apex of the rostrum, and the tarsal claws blackish ; prothorax with a band of fine golden pubescence at base and apex and a macular band across the middle ; elytra with pale golden pubescence and darker patches bearing black pubescence, including a large oblique patch running from the shoulder to stria 2 before the middle and sometimes extending to the suture, and very variable darker stripes and spots on intervals 3–7 behind the middle.

Head with the eyes contiguous. *Rostrum* as long as the head and pronotum in ♂, longer in ♀ (10 : 7), almost straight, the antennæ being inserted at or slightly beyond the middle in ♀ and at two-sevenths from the apex in ♂ ; the dorsum with a feeble median carina on the basal section and four rows of punctures which extend beyond the antennæ and bear subrecumbent white setæ. *Antennæ* with the first joint of the funicle slightly longer than the second ; in ♂ joint 3 longer than 4, 4 and 5 subequal and as long as or slightly longer than broad ; in ♀ joints 3, 4, 6 subequal, 5 shorter and as long as broad ; the club much longer than the scape in ♂, slightly shorter in ♀, the basal joint much longer than broad. *Prothorax* five-eighths as long as its basal width, with the sides straight, convex longitudinally, with dense fine shallow punctures which are stronger laterally. *Elytra* ovate, rather elongate, with the shoulders moderately prominent ; striæ 1 and 2 deep throughout, the others very shallow in the basal half but becoming deeper behind ; the hairs recumbent, those on intervals 1 and 2 stouter than the others. *Legs* rather stout, with white setæ ; femora with one long and three short black-tipped teeth ; tibiæ sinuate at the base, without any mucro; front tarsi with joint 3 shorter than 2.

Length 2·12–2·25 mm.; breadth 1·2–1·25 mm.

ASSAM: Garo Hills, 5 ♂♂, 7 ♀♀, bred from seeds of *Shorea robusta*, 8. vi. 1931 (*R. N. De*).

Subfamily MECININÆ.

Gymnetron anagallis, sp. n.

♂♀. Body black, the elytra (entirely) and legs (except the coxæ, tibial mucros, and tarsal claws) red-brown; the upperside with fairly dense grey hairs, which are denser (and therefore paler) at the sides of the pronotum, on the scutellum, and in a short patch on the suture near the apex, the hairs at the apex somewhat reddish; the underside rather thinly clothed with long grey hairs which are much shorter and sparser down the middle, the mesepimera and metepisterna with dense whitish plumose scales, the hind margin of the prosternum with a short fringe of plumose scales.

Head broad, with close shallow subconfluent punctures; forehead flattened, as broad as an eye, with recumbent ribbon-like setæ and no median fovea. *Rostrum* twice as long as the head, parallel-sided, gently curved, with the antennæ inserted at (♀) or beyond (♂) the middle; in ♂ strongly punctate and setose throughout, but especially in the basal half; in ♀ with the apical half bare and finely and sparsely punctate. *Antennæ* short and stout; the funicle with joint 2 clavate and longer than broad, 3 and 4 moniliform and as long as broad, 5 broader, transverse. *Prothorax* 1·6 times as broad as long, moderately rounded at the sides, widest near the base, constricted at the apex, the constriction being continued across the dorsum, which is finely and closely punctate, the punctures almost concealed by the transverse subrecumbent setæ, which are much denser and suberect at the sides but never squamiform. *Elytra* suboblong (3 : 2), jointly sinuate at the base, broader than the prothorax, almost parallel-sided in the middle; the striæ containing small close quadrate punctures which diminish behind, striæ 3 and 8 uniting at the apex; the intervals broader than the striæ, finely and irregularly punctate, with long subrecumbent hairs and rows of erect setæ, the hairs becoming erect at the apex and the sutural hairs on the declivity becoming longer, denser, suberect, and interlacing. *Legs* with the femora very stout, without a tooth ; hind tibiæ of ♂ with the apical mucro laminate and broadly truncate at its apex, with a tuft of white setæ just above it ; hind tarsi of ♂ with a tuft of long white setæ on the inner side of the first joint.

Length 3·2–3·4 mm. ; breadth 1·6–1·7 mm.

UNITED PROVINCES : Dehra Dun, 10 ♂♂, 2 ♀♀, on *Veronica anagallis*, 1. v. 1933 (*Maha Nand*).

In Reitter's key to the Palæarctic *Gymnetron* (Verh. naturf. Ver. Brünn, lxv. 1907) this species runs down to *G. vittipenne* Mars., which is a noticeably smaller insect with bright red elytra and the suture and lateral margins more or less broadly black ; joints 3–5 of the funicle are all strongly transverse ; the rostrum of the ♂ is proportionately shorter than in *G. anagallis* and that of the ♀ longer and thinner ; the mucro on the hind tibiæ of the ♂ is somewhat flattened but pointed, though there are similar tufts of hairs on the tibia and tarsus.

Subfamily *BALANININÆ.*

Balaninus gilvonotatus, sp. n.

♂♀. Derm pale testaceous-brown, with markings of pale straw-yellow scales ; head whitish beneath ; prothorax with a triangular patch in the middle of the base and a slightly larger subtriangular one in each basal angle ; elytra with a transverse basal scutellar patch extending from the suture to stria 2 or 3, and with numerous variable, and often asymmetrical, yellowish spots on the striæ, which sometimes coalesce to form a macular band just behind the middle ; the underside with narrow whitish scales and denser patches of larger yellowish scales on the side-pieces of the mesosternum and in the hind angles of the metasternum and metepisterna.

Head (in lateral view) forming an almost continuous curve with the dorsal edge of the rostrum in both sexes, the forehead almost as broad as the base of the rostrum and with a low narrow median carina. *Rostrum* less than half the length of the body, similar in the two sexes except that the punctures are rather stronger in ♂; a low median carina near the base only, the scrobes entirely lateral. *Antennæ* inserted at the middle (♂) or at three-eighths from the base (♀) of the rostrum; the funicle longer than the scape in both sexes, joint 1=2+3, the rest all longer than broad; the club ovate, with the two basal joints subequal and strongly transverse. *Prothorax* transverse (4 : 5), widest near the base and narrowing with a gentle curve to the apex, the base bisinuate; the dorsum with shallow reticulate punctation and an indefinite narrow sinuous median carina, with thin inconspicuous concolorous scaling on the disk. *Scutellum* short-ovate, densely squamose, subcarinate basally at the sides. *Elytra* a little longer than broad, much wider than the prothorax at the prominent rounded shoulders and rapidly narrowing behind, separately rounded at the apex, the base jointly trisinuate, the suture impressed at the base, and a distinct glabrous impression on each side of the scutellum; the striæ rather narrow, with shallow punctures, 1 not reaching the base, 4–6 curved inwards basally, 10 not interrupted; the intervals broad, asperate, the suture with recumbent interlocking setæ on the apical half. *Legs* with sparse setiform scales; the tooth on the anterior pairs of femora small but triangular, that on the hind pair sharper and followed by a short carina; the tibiæ distinctly sinuate at the base beneath; the hind tarsi with joint 2 longer than 3. *Sternum* with the upper edge of the mesepimera rising anteriorly, the mesosternal process obtusely convex. *Abdomen* curving upwards behind; ventrite 1 behind the coxæ not longer than 2, 2 as long as 3 in the middle and strongly angulate laterally; 5 with a shallow median impression in ♂, its apical margin broadly sinuate, the lateral processes with tufts of erect setæ; the pygidium broadly exposed in both sexes, in ♂ with a star-like tuft of radiating setæ in the middle.

Length 3·5–4·2 mm.; breadth 1·6–2·2 mm.

UNITED PROVINCES: Lachiwala, Dehra Dun, 16 ♂♂, 12 ♀♀, from fruits of *Ficus glomerata*, vii.–viii. 1931 (*S. N. Chatterjee*).

Distinguished from previously described Indian species by its characteristic colouring.

Subfamily CAMPTORRHININÆ.

Camptorrhinus albizziæ, sp. n.

♂♀. Derm black, with dense imbricated shiny scaling; prothorax leaden brown, turning blackish towards the base, with a broad median whitish stripe from the base to the middle and a narrow indefinite blackish stripe on the pleuræ from the base to the middle in a line with interval 10 of the elytra; scutellum white; elytra leaden grey, becoming paler laterally, with a broad curved whitish band across the top of the declivity, a short black stripe at the base of the suture, and a blackish lateral stripe starting on interval 10 at the base but soon going over on to 9; the underside arenaceous, with two darker stripes on the venter.

Head with dense overlapping scales, which are more or less concave and entirely conceal the sculpture; the eyes very nearly contiguous beneath. *Rostrum* of ♂ strongly punctate and squamose on the basal half, with traces of a narrow median carina beneath the scaling, the bare apical half with four irregular lines of distinct punctures on each side of a smooth median stripe; in ♀ the scaling confined to the base, the remainder with extremely fine sparse punctation. *Antennæ* with joint 1 of the funicle a little longer than 2, 3–7 all transverse and subequal. *Prothorax* about as long as broad, rounded at the sides, widest at the middle, broadly constricted at the apex, not entirely concealing the head when at rest, feebly bisinuate at the base; the dorsum convex longitudinally, highest at the middle, with a sharp but much abbreviated median carina, and closely set with deep punctures which are entirely covered by striated concave fan-shaped scales, which fit so closely into them that the general form of the puncture is quite apparent, and with scattered curved scale-like setæ which laterally are placed on low granules. *Scutellum* oblong, with dense white scaling. *Elytra* subcylindrical but rather short, with the apices separately rounded and the basal angles not projecting forwards; the striæ in pairs and rather irregular, the punctures partly filled by scaling, there being 16–17 in stria 1 from the base to the top of the declivity; intervals 3 and 5 strongly carinate and unevenly granulate, being highest and smoothest at the top of the declivity, where the height of 3 is as great as the space between 3 and 5, 3 becoming gradually lower to the apex, but 5 ending abruptly ; 1 obtusely raised on the declivity only, 7 and 9 only slightly raised throughout ; 2, 4, 6 without granules, depressed, narrow and sinuous in the basal two-thirds, broader and flat behind ; the scales as on the pronotum but smaller and more densely overlapping, the setæ only on the higher intervals, recumbent and very short, being almost as broad as long. *Legs* with mottled brown scaling, the femora usually with a small blackish patch near the base and another before the middle, the tibiæ with a submedian dark band ; the femora with the dorsal edge abruptly raised at the clavate part, the hind pair only shortly exceeding the elytra and bearing a much larger tooth than the others ; tibiæ similar in the two sexes, strongly compressed, broad, sharply carinate dorsally, deeply sinuate at the base inferiorly, the hind pair shallowly sinuate dorsally on the apical half. *Sternum* with the terminal part of the prosternal furrow projecting well beyond the hind margin of the prosternum.

Length 3·2–6·6 mm. ; breadth 1–2 mm.

ASSAM : Nakachari, Sibsagar, 1 ♀, from *Albizzia lucida*, 4. vi. 1921 (*Dr. C. F. C. Beeson*). UNITED PROVINCES : Jhajra, Dehra Dun, 2 ♂♂, 2 ♀♀, from *Shorea robusta*, x.–xi. 1925 (*B. M. Bhatia*) ; Dehra Dun, 2 ♂♂, 2 ♀♀, from *Albizzia* sp., iv. 1933 (*M. Bose*).

Nearly allied to the European *C. statua* F., which it much resembles in general facies, but *statua* lacks the shining glaze on the elytra and the white stripe on the pronotum ; the eyes are separated beneath by the greatest width of the antennal scape ; the striæ on the elytra are quite regular, intervals 3 and 5 are less elevated behind, etc.

Subfamily *SOPHRORRHININÆ.*

Rhadinomerus crinipes, sp. n.

♂♀. Derm black or piceous-black, fairly densely clothed with uniform sand-coloured scaling, but most of the septa between the punctures on the elytra bare ; underside with very sparse scales.

Head much flattened dorsally, with a broad supraocular furrow and a deep frontal sulcus ; the middle of the head with dense suberect fluted scales, the sides almost bare; eyes closely approximated beneath, the space between them not greater than the width of the apex of the scape. *Rostrum* of ♂ with the antennæ inserted at two-thirds from the base, the basal portion rugosely punctate and tricarinate, the apical part sparsely punctate; rostrum of ♀ with the antennæ at a little beyond the middle, rugosely punctate but not carinate in the basal third, very finely and sparsely punctate elsewhere. *Antennæ* red-brown; the funicle with joint 2 distinctly longer than 1, the remainder progressively diminishing in length, 7 as long as broad; the club subcompressed, with joint 1 a little shorter than 2. *Prothorax* transverse (1 : 1·2), parallel-sided from the base to beyond the middle, rather abruptly narrowed in front, but scarcely constricted at the apex, the apical margin strongly arcuate; the dorsum with small deep punctures separated by their own diameters or more and mostly concealed by large round or broadly ovate scales, the exposed punctures bearing a recumbent spatulate seta on the margin; the deeply fluted scales usually contiguous (especially in front) and then strongly convex, but sometimes they are separated, exposing the smooth derm, and then they are much flatter; no trace of a median carina. *Scutellum* ovate, with very dense narrow overlapping scales. *Elytra* suboblong, parallel-sided from the moderately prominent shoulders to beyond the middle, scarcely constricted behind and without any subapical callus; the striæ very broad and shallow, containing large quadrate punctures which diminish greatly behind, the intervals being narrow and but little wider than the septa between the punctures; on the basal half each puncture is covered by a very large scale, which is much larger than those on the rather thinly clothed intervals, but towards the apex the scales in the punctures are much narrower than those on the intervals; the intervals slightly convex, each with a row of short curved spatulate setæ, the scales all flat and fluted. *Legs* long and slender, with dense uniform sandy grey scaling; the femora entirely linear and with a minute sharp tooth; the front tibiæ of ♂ with a fringe of long hairs on the apical two-thirds; the tarsi with joint 2 slightly shorter than 3, front pair of ♂ with a fringe of short hairs. *Abdomen* with sparse small shallow punctures, ventrites 3 and 4 with a single transverse row, 5 closely punctate; scaling sparse and no erect setæ.

Length 7·0–7·5 mm.; breadth 2·7–3·0 mm.

ANDAMAN Is.: North Andaman, 2 ♂♂, 3 ♀♀, bred from wood of *Rhizophora mucronata*, v.–vi. 1929 (*B. M. Bhatia*).

A somewhat isolated species, characterized by its entirely uniform pale fluted scales, the inferiorly approximated eyes, the unusually elongate second funicular joint, the very slender subcylindrical femora and minute femoral tooth, and the fringed anterior tibiæ of ♂.

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Rhadimomerus apicetumens, sp. n.

♀. Derm piceous, with dense dark brown scaling; the prothorax uniform; the elytra with very faint darker markings; the sternum and sides of the venter with separated grey scales, the rest of the venter almost bare.

Head with the punctures hidden by dense curved scales, the supra-ocular furrows deep, the frontal fovea comparatively small and round; the space between the eyes beneath nearly as wide as the apex of the rostrum. *Rostrum* red-brown, with the antennæ inserted at a little beyond the middle, rugosely punctate and squamose near the base only and without any obvious median carina. *Antennæ* testaceous, the funicle sparsely pubescent, joints 1 and 2 equal, 3 longer than 4, 4–6 subequal and longer than broader, 7 as long as broad; the club subcompressed, joint 1 equal to 2. *Prothorax* slightly transverse (7 : 8), very slightly widening from the base to the middle, then roundly narrowing to the apex; the dorsum longitudinally convex, sometimes with a trace of a median carina, closely punctate, but the punctures concealed by round or ovate scales and recumbent spatulate setæ. *Scutellum* round, somewhat elevated, densely squamose. *Elytra* parallel-sided from the moderately prominent shoulders to the middle, with the usual subapical callus at the apex of interval 5 lacking, but with a large low boss-like callus at the apex formed by the junction of intervals 2 and 10; the shallow striæ containing quadrate punctures filled by a curved scale which is larger than those on the intervals on the basal half, but the punctures and scales diminishing behind, striæ 2 and 9 uniting deeply at the apex ; the intervals not wider than the punctures, sparsely punctate and densely squamose, but becoming more rugose at the base ; the scales overlapping and indistinctly fluted, the spatulate setæ subrecumbent and inconspicuous. *Legs* with uniform dense brown scaling ; the femoral tooth small, especially on the front pair ; the tibiæ quite straight, without any sign of the usual basal sinuation ; the hind tarsi with joint 2 equal to 3. *Abdomen* with moderately large deep punctures on ventrite 1 (3 to 4 deep behind the coxa), those on 2 much smaller and sparser, 3 and 4 with a single transverse row of punctures except at the sides, where there are more.

Length 4–6 mm. ; breadth 1·6–2·6 mm.

ANDAMAN IS. : North Andaman, 4 ♀♀, bred from *Rhizophora mucronata*, iv.–v. 1929 (*B. M. Bhatia*).

This species may be readily recognized by the apical calli on the elytra, the perfectly straight inner edge of the tibiæ, and the small round frontal fovea.

Rhadinomerus rhizophoræ, sp. n.

♂♀. Derm black, with dense scaling ; prothorax brown with a paler spot in the middle of the base and in the basal angles, and a pale patch on each side of the apical area, sometimes extending backwards ; elytra brown, sparsely mottled with indefinite grey and blackish spots, and with a pale spot at the base of interval 3 and another on the shoulders ; the underside with rather sparse pale scaling which is thinner in the middle of the venter.

Head densely covered with flat scales, the frontal fovea rather shallow, large, and round ; the space between the eyes beneath nearly as wide as the apex of the rostrum. *Rostrum* red-brown, with the antennæ inserted at five-sevenths from the base in ♂ and four-sevenths in ♀, strongly punctate and squamose on the basal half in ♂ and only near the base in ♀, but without any definite carinæ in either sex. *Antennæ* red-brown, very sparsely pubescent ; funicle with joints 1 and 2 subequal, 3 and 4 a little longer than broad, 5–7 transverse ; the club with joint 1 longer than 2. *Prothorax* nearly as long as broad, almost parallel-sided from the base to beyond the middle, thence narrowing rapidly to the apex with a slight sinuation; the dorsum rather strongly convex longitudinally, with the apical area depressed and with a trace of a narrow abbreviated median carina; the close punctures mostly covered by a large flat scale leaving the intervals partly exposed, other punctures with a recumbent spatulate seta. *Scutellum* round, densely squamose. *Elytra* rather narrow, suboblong, parallel-sided from the shoulders to beyond the middle, with a very small but rather sharp subapical callus; the dorsum rather strongly convex transversely, the shallow striæ containing quadrate punctures that are partly covered by scaling and each contains a small scale, smaller than those on the adjoining intervals; the intervals appearing broader than the punctures, with obsolescent granules that are quite concealed by the dense scaling and with a row of subrecumbent spatulate setæ. *Legs* with dense pinkish or grey scaling; the femora with a dark submedian dorsal patch and a paler one at the apex, the tooth small but sharp; the tibiæ blackish at the extreme base and with a small dark patch on the basal half, straight, the hind pair with the outer apical angle rounded; the hind tarsi with joints 2 and 3 subequal. *Abdomen* with close punctures on ventrite 1 (the punctures 4 deep behind the coxa), those on 2 sparser and separated by their own diameters, 3 and 4 with a single regular row of rather deep close punctures.

Length 6 mm.; breadth 2·4 mm.

ANDAMAN Is.: North Andaman, 1 ♂, 1 ♀, bred from *Rhizophora mucronata*, 5. iv. 1929 (*B. M. Bhatia*).

Apart from the absence of the apical callus on the elytra, distinguished *inter alia* from *R. apicitumens* by the transverse joints of the funicle and the small scales in the punctures on the elytra.

Mecistocerus ricini, sp. n.

♂♀. Derm black to piceous, with dense scaling; prothorax mottled with brown to grey scales, a very indefinite darker stripe on each side of the disk, and a pinkish patch on each side at the apex; elytra brown, with a variable blackish patch near the suture at about one-fourth from the base, a very irregular macular blackish band about the middle, some black spots on the declivity, very variable small greyish spots generally distributed, and a pinkish spot at the base of intervals 2 and 3 and another on the shoulder; the underside with rather sparse brownish-pink scales which are denser along the sides of the venter, ventrite 5 grey.

Head with dense brown and pinkish scaling, the frontal fovea deep and elongate; the space between the eyes beneath equal to two-thirds the width of the apex of the rostrum. *Rostrum* with the antennæ inserted at about the middle in ♂ and a little behind the middle in ♀, punctate and tricarinate in the basal third in ♂ and only near the base in ♀. *Antennæ* with moderately dense erect pubescence on the funicle, joint 1 slightly shorter than 2 and about as long as 3, 4–6 progressively diminishing slightly but all longer than broad, 7 slightly transverse; club with joint 1 longer than 2. *Prothorax* somewhat transverse (1 : 1·2), parallel-sided only in the basal fourth, thence roundly narrowing to the apex; the dorsum only slightly convex longitudinally, with deep rounded punctures which are not covered with scales and diminish rather rapidly in front, leaving a low narrow sinuous median carina; the narrow intervals densely squamose, the punctures containing a spatulate seta. *Scutellum* shiny, sparsely setose. *Elytra* ovate, broadest behind the shoulders and thence gradually narrowing, with a feeble obtuse subapical callus; the striæ with large rounded punctures which diminish behind and are partly concealed by scaling, each puncture with a small horizontal scale which is not larger than those adjoining it; the intervals narrow and uneven in the basal half, broader and convex behind, each with a row of small granules (mostly concealed by scales) bearing a suberect scale-like seta; the scales densely overlapping but not suberect near the base. *Legs* densely squamose; the femora pinkish or pale brown, with a darker brown patch on the clavate part (which also bears a dorsal black patch on the hind pair only) and at the apex, the tooth stout and triangular; the tibiæ pinkish or pale brown with an elongate black patch on the basal half but not quite reaching the base, distinctly bisinuate on the lower edge, the upper apical angle of the hind pair produced into a sharp right angle. *Sternum* with the pectoral furrow continued much further back than usual, ceasing well behind the coxal cavities and occupying half the length of the metasternum. *Venter* with ventrite 1 fairly evenly set with moderate round deep punctures, the intervals finely punctate, ventrites 3 and 4 with a rather irregular row of small punctures which are mostly concealed by scaling.

Length 4·5–8·0 mm. ; breadth 2·0–3·5 mm.

UNITED PROVINCES : Dehra Dun, 2 ♂♂, 1 ♀, bred from *Ricinus communis*, v. 1933 (*M. Bose*).

Similar in general facies to *M. corticeus* Fst., 1895, but differing from it and from all other Indian *Mecistocerus* known to me in the backward extension of the pectoral furrow.

Subfamily *PHÆNOMERINÆ*.

Tomicoproctus machili, sp. n.

♂. Derm black or piceous, with markings formed of brassy hairs ; head and rostrum densely hairy ; prothorax with a very ill-defined pattern formed by a lateral stripe on each side joined by a transverse apical band, two discal patches behind the middle which usually unite with the lateral stripes and a small spot in the middle of the base ; elytra with three ill-defined markings—a large triangular basal patch reaching the shoulders and extending to the middle along the suture, followed by a common broad dentate V-shaped band, and a macular apical band ; the underside with sparse pale hairs, forming a denser patch on the mesepimera.

Head with fine close rugulose punctation and dense suberect hairs ; the forehead shallowly concave, much broader than the eye, the latter moderately convex. *Rostrum* 1·5 times as long as its basal width, very wide at the base and rapidly narrowing to the apex, completely flattened dorsally as far as the upper margin of the scrobe, densely and confluently punctate except for a smooth median line on the apical half, and clothed with dense recumbent hairs. *Antennæ* testaceous-brown ; the funicle a little shorter than the scape and slightly longer than the club, with joint 1 as long as broad, the remainder strongly transverse and subequal ; the club broadly ovate, compressed. *Prothorax* longer than broad, subcylindrical, parallel-sided from the base to two-thirds, then gradually narrowed to the apex, truncate at base and apex, with fine reticulate punctation and a low narrow median carina; with the hairs recumbent and directed obliquely forwards and with scattered erect setæ. *Scutellum* transverse, with dark hairs. *Elytra* scarcely broader than the prothorax and 1·4 times as long, subcylindrical, 1·5 times as long as broad, shortly declivous behind and jointly truncate at the apex, the suture rather deeply impressed at the base; the striæ broad, with sharply defined margins and distant shallow punctures; the intervals flat, not or but little broader than the striæ, densely punctate; on intervals 1–3 the hair-like scales have their apices directed outwards on the basal half and directed posteriorly on the apical half, whereas on all the other intervals the apices are directed inwards; a row of rather long erect setæ on the alternate intervals. *Legs* with rather sparse recumbent setæ; the femoral tooth sharp, not triangular; the tibiæ with a small sharp tooth above the uncus, and on the middle pair an additional larger tooth a little beyond the middle. *Abdomen* with ventrite 2 as long as 3+4; pygidium of ♂ scarcely projecting beyond ventrite 5 (the apical margin of which is truncate), vertical, very shallowly concave, rugulose, with fairly dense suberect golden hairs, and without any apical mucro.

Length 2·8 mm.; breadth 1·0 mm.

UNITED PROVINCES: Nagsidh, Dehra Dun, 6 ♂♂, from *Machilus odoratissima*, vi. 1931 (*C. F. C. Beeson*).

The only previously described species is *T. eichhoffi* Fst., 1898, from Kamerun, which differs *inter alia* in having the forehead much narrower than the eye and the rostrum narrower and parallel-sided; the antennal club is elliptical and longer than the funicle; the hair-scales are closely recumbent and there are no erect setæ; the intervals on the elytra are much broader than the striæ; the femora are much stouter and the tooth broadly triangular; the tibiæ resemble those of *T. machili* in having a small spine above the uncus, though this was not mentioned by Faust; and, finally, the structure of the male pygidium is strikingly different.

Subfamily *BARIDINÆ*.

Baris dolosa, sp. n.

♂♀. Derm rather dull black, with black scales and markings formed of yellow scales; prothorax with a broad lateral yellow stripe (sometimes interrupted in the middle) and continued broadly down the apical margin to the coxæ, the posterior half of the pleuræ being always bare; scutellum with dense yellow scales; elytra each with two transverse macular yellow patches, one at the base on intervals 3–6, the other behind the middle on intervals 2–5; underside with dense pale yellowish scales, except at the sides of ventrite 1 and down the middle of ventrites 3–5.

Head bare, with small separated punctures. *Rostrum* of the same length in the two sexes, as long as the pronotum, bare, strongly curved at the base, much compressed dorso-ventrally towards the apex, coarsely punctate in ♂ and with a feeble median carina, more finely punctate and without a carina in ♀. *Antennæ* inserted at three-fifths of the rostrum; joint 2 of the funicle as long as broad, the rest transverse and widening distally. *Prothorax* about as long as broad, subconical, widest at the base, with the sides almost straight, shallowly constricted near the apex, which is truncate, the median lobe of the base broadly rounded; the dorsum gently convex longitudinally, highest not far from the base, with coarse close punctures without any median smooth line; the punctures on the pleuræ larger, rounded and separated. *Elytra* ovate, distinctly wider than the prothorax, widest at the shoulders, gradually narrowing behind, and jointly rounded at the apex; the striæ deep, with deep catenulate punctures which diminish greatly behind; the intervals slightly wider than the striæ, flat, with rasp-like punctures and each bearing two irregular rows of elongate curved subrecumbent black scales, the yellow scales also elongate, but broader, flatter, and densely overlapping. *Pygidium* broadly exposed in both sexes, but more oblique in ♀, semicircular, closely and coarsely punctate, and set with erect curved scales. *Venter* of ♂ impressed in the middle at the base, without any process on ventrite 5.

Length 4·0–4·5 mm., breadth 2·2–2·3 mm.

South India: Mathimudongudem, 1 ♂, 2 ♀♀, vi.–viii. 1923.

Superficially extremely like *B. neelgheriensis* Guér., but in the latter species the punctures on the pronotum are distinctly smaller, with an irregular smooth median line;

the posterior half of the pleuræ is squamose, with longitudinally confluent punctures, the intervals tending to form ridges; the striæ on the elytra are much less deep and the punctures in them shallower, the elytra themselves being more elongate; the sides of ventrite 1 are always squamose. But the most striking difference is in the anal ventrite of the ♂, which in *B. neelgheriensis* bears a broad, smooth, lancet-shaped, laminate process projecting forward at an angle—a character which appears to have been overlooked previously.

Subfamily *Cossoninæ*.

Phlœophagosoma ficus, sp. n.

♂♀. Black, rather shiny, bare, except for rows of minute setæ on the elytra.

Head without any constriction; the punctures on the vertex rather widely separated, those on the forehead denser, the elongate frontal fovea very shallow and sometimes obsolete; the eyes moderately convex. *Rostrum* a little more than half the length of the pronotum, stout, parallel-sided, punctate like the forehead, but the punctures often subconfluent longitudinally in the basal half, with a short median stria between the antennæ and a broad shallow median impression behind it; very similar in the two sexes, but slightly shorter and a little more curved in ♂; the scrobes extending forwards well beyond the antennæ and sharply bent downwards behind, their upper edge forming almost a right angle close in front of the eye. *Antennæ* red-brown, with the second joint of the funicle strongly transverse. *Prothorax* longer than broad, widest behind the middle, subpyriform, especially in ♂, in which the sides are more strongly rounded and the apical constriction more marked; the dorsum with rather close, deep, even punctures, mostly separated by less than their own diameters, and with an abbreviated smooth median line. *Elytra* distinctly wider than the prothorax, parallel-sided for two-thirds their length; the striæ deep, with strong separated punctures which are not broader than the striæ and diminish behind; the dorsal intervals about as broad as the striæ, flat, with a row of rather close distinct punctures, each bearing a minute subrecumbent seta only observable with difficulty; interval 10 finely carinate throughout and 9 on the apical half only. *Legs* coarsely and sparsely punctate; tibiæ widening from base to apex and with a sharp mucro; joint 2 of the hind tarsi transverse.

Length 2·25–3·50 mm.; breadth 0·75–1·20 mm.

UNITED PROVINCES: Dehra Dun, 12 ♂♂, 9 ♀♀, from *Ficus* sp., v.–vi. 1931 (*M. Bose, C. D. Pant*).

The abruptly angulated scrobes and the narrowly carinate lateral intervals of the elytra will serve to distinguish this species.

LVI.—*On a supposed Species of* Heteropora (*Bryozoa*).

By FOLKE BORG, D.Sc., Zoological Institute, University of Upsala, Sweden.

[Plate XIV.]

THE genus *Heteropora* de Blainville (1830, p. 381) includes, as is well known, numerous fossil species from Jurassic and later beds. The first to record the existence of recent species of that genus was Waters (1879, pp. 390 ff.), who described one species from the sea off N. Japan and another from the coast of S.E. Australia. Through the works of Busk (1879, pp. 724 ff.), P. H. MacGillivray (1881, p. 17), Kirkpatrick (1888, pp. 16 f.), Waters (1904, pp. 98 f.), Miss Alice Robertson (1910, pp. 258 ff.), O'Donoghue and O'Donoghue (1923, pp. 14 f.; 1926, p. 29), and others some more recent species of this very interesting group have been discovered, occurring in very widespread localities, viz., in the seas round New Zealand, on the south coast of Australia, off the coast of S. Africa, in the Antarctic Sea south of S. America, and on the Pacific coast of N. America.

The genus *Heteropora* belongs to the Stenolæmatous * (Cyclostomatous) Bryozoa. The diagnosis given by de Blainville (*l. c.*) for his genus *Heteropora* was as follows:—"Cellules [zoïds; *cf.* my paper 1926, p. 186] rondes, poriformes, complètement immergées, de deux sortes; les unes bien plus grandes que les autres, et assez régulièrement éparses à toute la surface d'un polypier calcaire, fixé, lobé ou branchu." The genotype, selected by Gregory (1896, p. 201), is *Heteropora cryptopora* (Goldfuss, 1826, p. 33).

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* As to this name see a former paper of mine (1926, p. 490).

In a previous paper (1933) I have distributed the eight recent species of *Heteropora* among four genera. These are all referred to one family, the Heteroporidæ, which was proposed by Waters (1880, p. 157) and was used for the first time by Pergens and Meunier (1886, p. 223).

One of the most characteristic features of this family is the presence in all its species of two kinds of zoïds, the " normal " ones or autozoïds (the " cellules grandes " of de Blainville) and the small stunted ones or kenozoïds (the " cellules petites " of de Blainville). Each of the former contains a polypide, while the latter do not. In most species of Heteroporidæ the kenozoïds far exceed the autozoïds in number.

The species of the Heteroporidæ hitherto known, both recent and fossil, either form massive incrusting zoaria of varying shape or they are stud-shaped or bushy, and in the latter case often richly branched like a coral. Of course, like the zoaria of all other Stenolæmatous Bryozoa they are always sessile, being attached by means of a basal supporting disc to a suitable substratum.

Some thirty years ago, however, P. H. MacGillivray (1895, p. 144, pl. xxi. fig. 15) described and figured under the name of *Heteropora pisiformis* a species of fossil Bryozoa widely differing from all others known up to that time as belonging to the Heteroporidæ. The diagnosis given was as follows :—" Zoarium nearly spherical, apparently free. Surface closely covered by rounded polygonal apertures of varying size, so that it is not evident in many cases which are zoœcia and which are cancelli [kenozoïds], as all gradations in size are present. Bounding walls of apertures stout. The apertures of all sizes usually closed by a concave porous plate placed slightly within the mouth." The specimens thus described were from Tertiary strata in Victoria.

This is a very remarkable species, chiefly because the zoarium is said to be *spherical* and *free*. It is hard to understand how such a condition could possibly have been acquired, not only in the Heteroporidæ but in any Stenolæmatous Bryozoa. There exist, as we know, a number of Cheilostomes, belonging to the genera *Cupularia* (*Cupuladria*), *Lunularia*, *Selenaria*, etc. (*cf.*, for instance, Levinsen, 1909, pp. 154 ff. ; Canu and Bassler, 1920, pp. 103, ff., 238 ff.; Harmer, 1926, pp. 266 f.; 1931, pp. 150 ff.), the zoaria of which are free, but these are obviously in no way comparable to the species described in the work of MacGillivray just cited, and there is no question of a spherical zoarium in any of these genera.

It may be worth mentioning here that the description of the "*Heteropora pisiformis*" quoted above was not written by MacGillivray himself, though he seems to have named and figured the species. The work was not issued until after his death, and a number of species of which no description had been made by MacGillivray were recorded in an Appendix written by another person (*cf.* MacGillivray, 1895, Introd. Note). Among these species is the remarkable *Heteropora pisiformis*.

These circumstances make the correctness of the determination of the species named *Heteropora pisiformis* seem perhaps a little uncertain, and the figures given (pl. xxi. figs. 15, 15 *a*, 15 *b*) are far from convincing.

Later on Maplestone (1911, p. 118) mentioned that he had found *Heteropora pisiformis* MacGill. living in the Tasman Sea, whence it had been brought home by the 'Miner' Deep-sea Dredging Expedition. Unfortunately Maplestone gave neither description nor figure of the specimens before him, so it is impossible to know if they are really identical with MacGillivray's specimens. I think it likely, however, that they are so, for no doubt Maplestone had access to the type-specimens of MacGillivray.

Now, as I thought it would be of some interest to re-examine the material available, in order to know what this very peculiar species was like, I wrote to Mr. A. A. Livingstone, at the Australian Museum, Sidney, who kindly forwarded me a slide, bearing the Museum label U 378, containing three specimens of the supposed *Heteropora pisiformis* from the 'Miner' expedition, determined by C. M. Maplestone. I have some reason to believe that these specimens represent the whole of the 'Miner' material of this species, though it is impossible now to be quite sure about this point.

The result of my investigation of this material is that *none of the specimens examined represent a Heteropora*. One is a small fragment of a calcareous alga. The second is so strongly incrusted with grains of sand that it is impossible to say what kind of organism, if any, it represents; at all events this much is clear, that there is absolutely nothing to be ascertained supporting the opinion that it could be a *Heteropora*. The third piece is shown in Pl. XIV. fig. 1. In order to enable comparison to be made I have shown in Pl. XIV. fig. 2 the top of a branch of an indubitable *Heteropora*, viz., *H. magna* O'Donoghue & O'Donoghue. Both figures are photo-micrographs. In Pl. XIV. fig. 2 we see the autozoïds (*az.*) and the kenozoïds (*kz.*) so characteristic of all species of the Heteroporidæ. The apertures of both kinds of zoïds are rounded or somewhat angular, as is usual in Stenolæmatous Bryozoa. The walls separating the apertures are rather thin here, but they grow thicker proximally, though they never become so thick as those shown in Pl. XIV. fig. 1.

The surface of the fragment seen in Pl. XIV. fig. 1 exhibits very obvious signs of having been severely damaged. Many of the apertures are filled, wholly or partly, with small grains of sand, while others have had their edges more or less broken. There are, however, some apertures left that enable us to state with certainty that the fragment in question must belong to a species of Cheilostomatous Bryozoa. One of these apertures (*ap.*) is well seen in the figure. In the middle of its proximal rim a distinct sinus can be detected, and on each side, some distance from the sinus, a small protuberance is found representing, in all probability, one of the hinge-teeth for the operculum, which is lacking. Some of the apertures are larger than the one just alluded to, indicating that a portion of the frontal wall of the zoïd has been broken away (*cf.* Pl. XIV. fig. 1). There are also here and there smaller apertures, often elongated in shape, whose existence leads me to suggest that the specimen may have been provided with avicularia. Possibly it represents a small piece of a zoarium of a Celleporid or a Holoporellid, for among the representatives of these two families—occurring abundantly on Australian coasts—there are some which form incrusting zoaria with a strongly nodulous surface. One of these nodules, which had been broken off from its zoarium, rolled and ground, would indeed bear a close resemblance to the specimen here described.

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EXPLANATION OF PLATE XIV.

Fig. 1. One of the specimens thought by Maplestone to belong to *Heteropora pisiformis* MacGill. In reality it represents a fragment of a zoarium of an Ascophorous Cheilostome (Cellopori1 ?). *ap.*, aperture of one of the zoïds. Photomicrograph, × 16.

Fig. 2. Top of stem of a species of *Heteropora*, viz., *H. magna* O'Donoghue & O'Donoghue, seen from above, to show the differences between it and the so-called *Heteropora pisiformis*. *az.*, apertures of young, developing autozoïds; *kz.*, apertures of young, developing kenozoïds. Photo-micrograph, × 12.

LVII.—*On Two Species of* Corixidæ *from the Himalayas.*

By Dr. T. Jaczewski, Polish Museum of Zoology, Warsaw, Poland.

Owing to the kindness of Mr. W. E. China, of the British Museum, I have received for study twenty-seven specimens of Corixidæ, collected by Major R. W. G. Hingston during the Mt. Everest Expedition in 1924. The material comprises two species, one of which seems to be new to science. The stations where the insects were taken are situated between 11,000 and 15,000 ft. (about 3300–4600 m.) above sea-level, and are thus the highest yet recorded for Corixidæ.

Sigara gebleri (Fieber).

Sikhim, Gnatang, 12,000 ft., 31. iii. 1924, "in mountain pool," 2 ♀♀.

Tibet, Yatung, 11,000 ft., 4. iv. 1924, 7 ♂♂, 7 ♀♀.

Tibet, Tsango Chumbab, 14,000 ft., 5. v. 1924, 2 ♂♂, 3 ♀♀.

Tibet, Pangle, 15,000 ft., 8. v. 1924, 1 ♀.

This species is distributed over a very large area in Northern Asia, reaching in the west as far as the extreme south-east of Europe (Lower Volga) and eastern Caucasus. It has also been recorded from Alaska, although this seems to require further verification. Its presence in the Himalayas is very interesting, as it also indicates a wide distribution of this species in Central Asia.

As to their morphological characters the above specimens are identical with those redescribed by Dr. O. Lundblad *.

Sigara himalayensis, sp. n. (Figs. 1–4.)

Tibet, Tsango Chumbab, 14,000 ft., 5. v. 1924, 2 ♂♂, 3 ♀♀.

Shape of body typical for the genus. Ground-colour of pronotal disk and of hemelytra blackish brown; head, underside, and legs yellow; thoracic sterna and basal portion of venter more or less blackish; ends of intermediate tarsi, as well as apex of basal joint and base of terminal joint of hind tarsi, especially interiorly, blackish.

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* Ent. Tidskr., Stockholm, xlviii. 1927, pp. 77–80, pl. i. figs. 1–7, pl. ii. figs. 8–10, pl. vii. fig. 46.

Head, when seen from above, about half as long as the pronotal disk. Frontal arch a little more prominent in the males than in the females. Facial impression of males small and rather shallow, with rounded margins, not reaching the eyes laterally and rising only little between them. Face almost glabrous in both sexes. Fourth antennal joint equals in length about 63 per cent. of the length of the third.

Pronotal disk somewhat more than half as long as wide, crossed by about twelve partly furcated pale transverse stripes, which are nearly twice as wide as the dark intervals between them. Lateral angles almost rectangular posteriorly. Posterior angle rounded but well pronounced. Pronotal keel visible only in front. Lateral lobes of the prothorax nearly parallel-sided, truncated at the apex, resembling a little those found in the species of the subgenus *Anticorixa* Jacz.

Fig. 1.

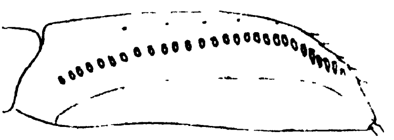


Fig. 2.

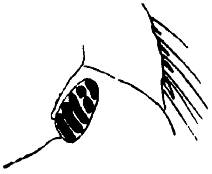


Fig. 3.

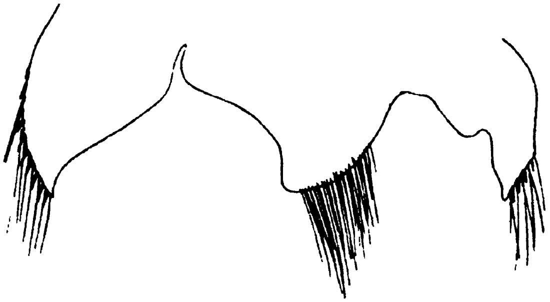
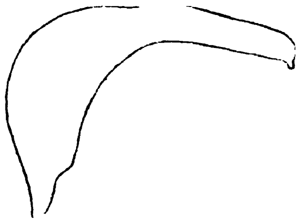


Fig. 4.



***Sigara himalayensis*, sp. n., ♂.**

Fig. 1.—Pala, × 60.
Fig. 2.—Strigil, × 60.
Fig. 3.—Central lobe of seventh abdominal tergite, × 33.
Fig. 4.—Right paramere, × 60.

Rastration very feeble on the pronotal disk and at the base of the clavus, corium more or less smooth. The pale transverse stripes of the basal part of the clavus are fairly regular and distinctly widened ; on the terminal half of the clavus and on the corium they become more interrupted and furcated. Membranal suture marked by an incomplete pale oblique line ; membranal markings of the usual type ; left membrane a little paler interiorly. Marginal area pale. The pale stripes of the hemelytra a little wider than the dark spaces between them. Pubescence of the hemelytra moderately developed, consisting of very thin pale hairs.

Metasternal xiphus rather short, blunt at the apex, with straight lateral margins.

Front legs of the male : trochanter with a tuft of longer hairs at the middle of its convexity. Femur showing no thickened hairs on the basal part of its front side. Tibia simple, three-edged towards the apex. Pala (fig. 1) showing no peculiar features in shape, resembling most that of *S. hieroglyphica* (Duf.). Coxa, trochanter, base of femur, and apical part of outer palar margin more or less infuscated. The single row of stridulatory pegs repeats almost exactly the curvature of the outer palar margin. The number of pegs on three palæ examined was found to be 28, 28, 29. The distal pegs are a little longer than the basal ones. Outer palar bristles about 10, the inner ones about 25 in number.

Relative lengths of the various parts of the intermediate and hind legs, expressed in percentages of the length of the corresponding femora, are as follows :—

	Femur.	Tibia.	Tarsus.	Claws.
Int. legs	100	48·2	34·6	35·4
	Femur.	Tibia.	Tarsus 1.	Tarsus 2.
Hind legs	100	98·6	105·7	51·4

Intermediate tarsi of almost equal length with the claws. Upper side of hind femora with a short row of about 5 small spines, lower side with over 30 scattered spines.

Strigil (fig. 2) small, with 5 short combs. Central lobe of seventh abdominal tergite large and wide (fig. 3), its left margin widely emarginate, the right one convex, fringed with numerous long bristles.

Right paramere as shown in fig. 4; left paramere with a curved claw-like apex, armed with numerous short spines. Processus of ninth abdominal segment simple. Inner sheath of penis anchor-like at the end.

Length 6·5–7 mm.

This species differs from other representatives of the genus, both Palæarctic and Oriental, by the sexual characters of the males; its infuscated palæ and hind tarsi, combined with the presence of a strigil, are also remarkable. Its systematic position among the other species of the genus *Sigara* (Fabr.) Schum. cannot be established, however, exactly until we have more knowledge concerning the Corixidæ of Central Asia.

LVIII.—*The Genus* Constellaria *Dana in Britain.*

By Professor H. P. Lewis.

There is probably no family belonging to the Trepostomata which is easier to recognize than the Constellariidæ, and no genera of the order with more conspicuous characters than those possessed by *Constellaria* Dana and *Stellipora* Hall. These genera are represented among the Ordovician and early Silurian bryozoa of America and Esthonia, but, so far as I am aware, they have not been recorded from the British Isles.

Fossiliferous limestone, rich in fragments of *Favosites* and bryozoa, including *Constellaria*, occurs among the rock-types recently collected by Mr. J. I. Platt for a description of the conglomerates at Allt Goch, near Llanfyllin, Montgomeryshire *. Prof. W. B. King's work indicates that these rocks occupy, locally, a basal position in the Valentian †, but it is possible that the fragmental shelly material was derived from the Upper Ordovician rocks on which the Valentian sediments rest uncomformably in this area.

Constellaria Dana and *Stellipora* Hall, in all probability, are synonyms. In both these genera the wall-structure is granulose, with hollow spines or granules instead of acanthopores: the mesopores in each are aggregated into stellate maculæ, and, in the interspaces between the radiating portions of the maculæ, the zoœcia occur in clusters. These features are seen best in tangential sections. The stellate maculæ occupy depressions on the surface of the zoarium, and the clusters of zoœcial apertures occur on elevations or ridges between the macular rays.

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* Geol. Mag. vol. lxx. 1933, p. 268. I am indebted to Mr. Platt for providing me with the material from Allt Goch.

† Quart. Journ. Geol. Soc. vol. lxxxiv. 1928, p. 695; Mem. Geol. Surv., "Oswestry," 1929, pp. 67 & 73.

Dybowski * and Nicholson † regarded *Constellaria* and *Stellipora* as synonyms, but Bassler ‡ keeps the two genera distinct. Following Ulrich, Bassler states that, while in *Constellaria* Dana, 'Zoophyta,' p. 537 (1846) (*Stellipora* Milne-Edwards & Haime §, 1860; *Stellipora* (pars) Dybowski, 1877: genotype, *Ceriopora constellata* (Van Cleve) Dana, 1846), the zoarium grows into erect flattened branches, or fronds, from a basal expansion which is attached to foreign bodies, *Stellipora* Hall, Nat. Hist. New York, vol. i. p. 49 (1847) (*Stellipora* (pars) Dybowski, 1877: genotype, *Stellipora antheloidea* Hall, 1847), differs in its encrusting or free lamellate method of growth and in having the interspaces between the raised zoœcial clusters composed of mesopores alone. In my opinion these characters are not sufficiently important, or constant, to warrant the separation of the genera, and *Constellaria* Dana has priority.

It is probable that *Nebulipora* M'Coy, Ann. & Nat. Hist. ser. 2, vol. vi. p. 282 (1850), is also a synonym of *Constellaria*. M'Coy's diagnosis of this genus is as follows:—"Corallum encrusting or forming lenticular masses with concentrically wrinkled epitheca below; composed of small prismatic tubes, perpendicular, or nearly so, to the upper surface on which they open; among the small tubes are regularly arranged clusters of similar tubes of rather larger size; all the tubes in contact, traversed by horizontal diaphragms at regular distances (walls apparently perforated by rows of small foramina)." M'Coy also refers to "the imperfect star-like clusters of large tubes" in describing *Nebulipora lens* from the "Caradoc Sandstone of Horderly West," Shropshire *.

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* Dybowski, 'Die Chaetiden d. Ostbaltischen Silur-Form,' 1877, p. 42.

† H. A. Nicholson, 'Tabulate Corals,' 1879, p. 300, and 'The Genus *Monticulipora*,' 1881, p. 97.

‡ R. S. Bassler, "The Early Palæozoic Bryozoa of the Baltic Provinces," United States Nat. Mus. Bull. lxxvii. 1911, p. 221.

§ Hist. Nat. des Corall. vol. iii. 1860, p. 281.

Through the kindness of Mr. Henry Woods, F.R.S., and Mr. A. G. Brighton, I have been able to examine prototypes of M'Coy's species of *Nebulipora* preserved in the Sedgwick Museum, Cambridge. No trace of M'Coy's "foramina" can be detected. In size and general superficial characteristics and in the dimensions, shape and arrangement of the "tubes", close correspondence with species of *Constellaria* is evident. If topotypes of *Nebulipora lens* can be discovered from which thin sections can be cut, it appears very probable that the microstructure of this species will be found to be that of a *Constellaria*. It is of interest to note that *Nebulipora lens* M'Coy was recorded by Salter from Moel Uchlas, Llanfyllin, and *Nebulipora* sp. from Mathyrafal Ffrîdd, in the same neighbourhood †.

TREPOSTOMATA Ulrich.

Constellariidæ Ulrich.

CONSTELLARIA Dana.

Genotype, *Ceriopora constellata* (Van Cleve) Dana, 'Zoophyta,' 1846.

Constellaria cambrensis, sp. n.

Holotype: R. 30151, British Museum (Nat. Hist.), Dept. of Geology. Valentian, Allt Goch, 1½ miles S.W. of Llanfyllin, Montgomeryshire. (Figs. *a* & *b*.)

Diagnosis: *Constellaria* with a symmetrical arrangement of the zoœcial clusters, in which the zoœcia are often grouped biserially; macular structure intermediate in character between that of *C. varia* Ulrich ‡ and "*Stellipora*" *constellata* Dybowski §.

Description.—The specimen, of which a tangential section is figured, forms part of a lamellar expansion which must originally have exceeded 15 mm. in width. The characteristic feature of tangential sections is the distinct stellate pattern of the maculæ, emphasized by the regular arrangement of the clusters of zoœcial apertures between the macular rays. The zoœcial apertures are subcircular, from 0·15 mm. to 0·3 mm. in diameter and tend to have a biserial grouping in the radiating clusters, in which the maximum number in any one cluster rarely exceeds sixteen. The walls of the zoœcia are usually thicker and more obviously granular than those of the mesopores, and they contain infrequent hollow spines in place of acanthopores.

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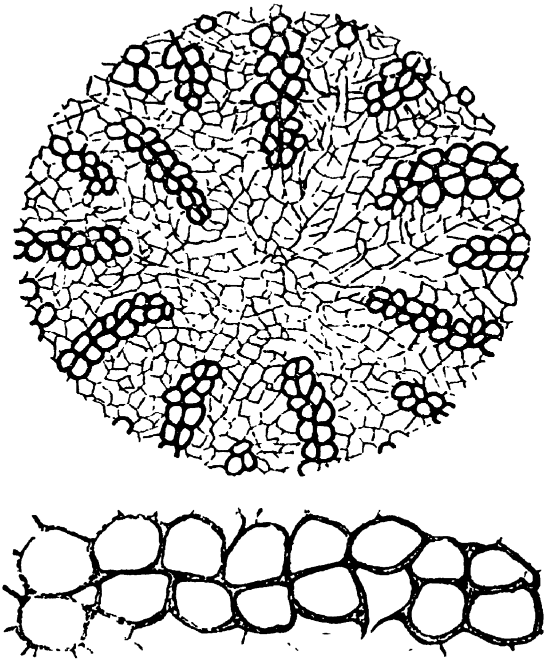
* Brit. Pal. Foss. Geol. Mus. Cambridge, 1851, p. 23, and pl. i. c, figs. 7, 7 *a*, 7 *b*.

† Cat. Cam. Siln. Foss. Cambridge, 1873, pp. 41 & 73.

‡ Geol. & Nat. Hist. Surv. Minnesota, vol. iii. pt. i. 1893, p. 311, pl. xxi. figs. 1–7.

§ Dybowski, *op. cit.* 1877, p. 48, pl. iii. figs. 9, 9 *a*.



Constellaria cambrensis, sp. n.

a. Tangential section through one stellate macula, showing the radiating clusters of zoœcia occupying the spaces between the macular rays. × 10. B.M. R. 30151.

b. Transverse section through a cluster in which the zoœcia are grouped biserially. × 30. B.M. R. 30151.

Comparison with other Species.—The internal structure of *C. cambrensis* is in most respects intermediate between that of *C. varia*, as described and figured by Ulrich and by Bassler, and that of " *Stellipora* " *constellata*, judging from Dybowski's figures of his species. This is seen, in particular, in the form and disposition of the mesopores, which show, on the whole, closer similarity to "*S.*" *constellata* and "*S.*" *revalensis* Dyb., but which, in places, are indistinguishable from those of *C. varia.* In "*S.*" *constellata* some of the zoœcial clusters are confluent, but in *C. cambrensis*, as in *C. varia*, they appear to be always segregated from one another. *C. cambrensis* agrees with *C. varia* as figured by Bassler from the Wassalem Beds of Uxnorm, Esthonia *, in having occasional isolated zoœcia in the macular rays.

The prototypes of *C. varia* came from the *Nematopora* bed of the Lower Trenton at Cannon Falls, Minnesota. According to Bassler, the species occurs, also, at about the same horizon in Canada and Tennessee. He records it as well from the Jewe limestone and the higher Wassalem Beds of Esthonia. The type of "*S.*" *constellata* Dyb. appears to have come from the Lyckholm limestone horizon at Hohenholm on the island of Dago. *C. varia* is, therefore, Caradocian and "*S.*" *constellata* probably Ashgillian, and the age of *C. cambrensis* approximates to that of the latter species.

LIX.—*The Systematic Position of the Family* Hemipeplidæ (*Coleoptera*), *and Descriptions of new Species.* By Hugh Scott, Sc.D., F.L.S., Department of Entomology, British Museum (Natural History).

The family Hemipeplidæ was first definitely erected by Arrow † to receive the curious genus *Hemipeplus* Latr., the position of which had long been doubtful. It had been placed in Cucujidæ, being associated by Lacordaire ‡ with *Ino* in a tribe Hemipeplides. *Hemipeplus* and *Ino* actually differ very much, and Leconte and Horn § were apparently the first to propose a subfamily of Cucujidæ, Hemipeplinæ, for *Hemipeplus* alone, an arrangement followed by Fowler [*], and much more recently by Hetschko [†] in his Catalogue of Cucujidæ. Hetschko's Catalogue and Arrow's paper were published in the same year and month, so that neither writer knew at the time what was being written by the other. Sharp [‡], however, had previously expressed the view that *Hemipeplus* should find a place, not in Cucujidæ, but among the Heteromera, and Casey [§] considered that it should form a distinct family near Œdemeridæ ; while Arrow also thought it impossible to include *Hemipeplus* in any known family, and therefore proposed a family, in the Heteromera, to receive it and an allied genus *Holopeplus*, the latter of which he described in the same paper.

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* Bassler, *op. cit.* 1911, text-fig. 121 *a*, p. 220.

† Ann. & Mag. Nat. Hist. (10) v. pp. 225–231 (Feb. 1930).

‡ Hist. Nat. Ins., Col. ii. pp. 393, 404 (1854).

§ "Classification of the Coleoptera of North America," Smithson. Misc. Coll. no. 507, pp. 132, 134 (1883).

Having before me a new species from Rodriguez Island (included in the collection made there by Mr. H. P. Thomasset and the late H. J. Snell in 1918), represented by a fair amount of material, I have examined the genital armature of the male and the hind wings, both of which are described below, in the hope of throwing light on the systematic position of the family. The result supports the opinions of Sharp, Casey, and Arrow. There are no external characters to distinguish the sexes, but, when the sex of individuals is determined by dissection, the typical heteromerous tarsal formula (5. 5. 4) is found to hold good in both sexes. The wing-venation throws comparatively little light on the affinities of the family, being of a type found, under different forms, in many families, but notably in the Heteromera. The ædeagus of the male is of a pattern characteristic of certain families of Heteromera (other than Tenebrionidæ), which were placed by Sharp and Muir, on account of the form of this organ, in their series Cucujoidea. Among the Coleoptera of which I have seen figures or specimens of the ædeagus, *Oncomera* (Œdemeridæ) is the genus in which this organ most nearly resembles that of *Hemipeplus*. All that can be said is that Hemipeplidæ should be associated with certain heteromerous families (Melandryidæ, Œdemeridæ, etc., but probably not Tenebrionidæ), and that they bear out the well-known view of the difficulty of separating these families sharply from Cucujidæ.

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[*] 'Fauna of British India, Coleoptera,' General Introduction etc., p. 107 (1912).

[†] 'Coleopterorum Catalogus,' pt. cix. p. 90 (Feb. 1930).

[‡] Biol. Centr.-Amer., Col. ii. 1, p. 512 (1899).

[§] 'Memoirs on the Coleoptera,' vii. p. 112 (1916).

Geographical Distribution.—Including the species described in this paper, from 15 to 18 * representatives of *Hemipeplus* are now recognized. Under the heading of the genus, remarks are made below on certain structural differences among the species, which may be sufficient to demarcate groups of species within the genus, but which I prefer not to use for splitting *Hemipeplus* into two or more genera. The parts of the world in which the species have been discovered comprise the Southern United States, Mexico, the West Indies, and Brazil; several parts of Tropical Africa (West, East, and South); Madagascar and Rodriguez Island; Borneo, Celebes, and North Australia. The allied genus *Holopeplus* occurs in Cuba.

Biology.—Little information can be given under this head. *H. nuciferæ* Arrow has been recorded as feeding, in the adult state, on young unexpanded leaves of the coconut-palm in Celebes †. In the Southern United States *H. marginipennis* has been found abundant under the bark of palmetto (*Chamærops palmetto*) and *H. microphthalmus* has been taken flying at night ‡. The latter statement shows that the hind wings, though short, are functional.

Four of the specimens of the new species, *H. dollmani*, collected by the late Hereward C. Dollman in North-Western Rhodesia, have the note attached: "in newly built hut," and two of the same species taken, much more recently, by Dr. H. Silvester Evans in the Belgian Congo bear the record "in hut." Possibly these specimens flew to light, or they may have emerged from the woodwork. Another Rhodesian example collected by Dollman is labelled "mopani bark" (*i. e.*, the tree *Copaifera mopani*, Leguminosæ), but no record exists as to whether it was under, or merely on, the bark, though probably the former is meant.

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* The number is 15, if *H. dohrni* Pasc., *H. microphthalmus* Schwarz, and *H. dejeani* Waterhouse are regarded as synonyms of *H. marginipennis* Leconte, as suggested by G. H. Horn (Trans. Amer. Ent. Soc. viii., Monthly Proc. pp. xii–xiv, 1880). This synonymy has been followed in some later writings, including Hetschko's Catalogue. But it has not always been accepted. In the British Museum the types of *H. dohrni* and *H. dejeani*, and examples standing under the names *H. marginipennis* and *H. microphthalmus* do not, at a cursory glance, seem to be all one species. I cannot go further into this matter at present.

† Arrow, *op. cit.* pp. 227, 229.

‡ Casey, Trans. Amer. Ent. Soc. xi. p. 101 (1884); cited by Wheeler Zoologica (New York), iii. no. 5, p. 183 (1921).

In Rodriguez Thomasset and Snell obtained 29 examples of *H. rodericensis* in 1918, and one has the note attached, in Mr. Thomasset's handwriting, "from hearts *Pandanus* leaves." Some years afterwards Mr. Thomasset wrote from South Africa (12. v. 1924), in answer to an inquiry from me, "as far as I remember [the beetles were] found on the surface of Pandanus leaves, generally sitting in the rib groove, but I cannot be certain now." Nor did he remember with which of several species of *Pandanus* ("vacoa" trees) the *Hemipeplus* was associated. His note about the "hearts" of Pandanus, written at the time, makes it appear likely that the beetles attack the young unexpanded leaves (as *H. nuciferæ* does with the coconut-palm), while the extremely flattened shape of the insect would enable it to move in the narrow spaces between the leaf-bases.

The evidence is, therefore, that the species of *Hemipeplus* are associated with palms and *Pandanus*, and possibly with dicotyledonous trees in some cases, and that they sometimes fly to light. But it seems that nothing is known of their early stages.

Wing.—The wing of *H. rodericensis* is shown in fig. 1, the principal folds being indicated by broken lines. Since, though considerably wider than the elytron, the wing is only the same length as the latter, there is little transverse folding, the only cross-folds being those indicated at *a*, *a*, in the front part of the wing near its apex. There are three longitudinal folds in the front half of the wing, and a fourth in the anal region, close behind the vein numbered 4, where the anal lobe is doubled back when the wing is folded.

The venation is a modified form of the type called by Ganglbauer * "cantharid." Costa and subcosta are difficult to distinguish. A deep concave wrinkle lies along the basal fifth just behind the front margin.

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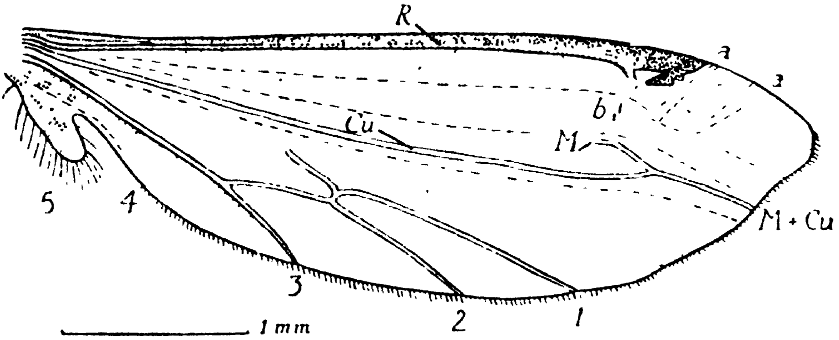
* "Systematisch-koleopterologische Studien," München. koleopt. Zeitschr. i. pp. 271–319 (1903).

The first clearly marked vein is that which I take to be the radius (R). The media (M) is obliterated except in its distal part, where it unites with the cubitus (Cu) in the manner normal for this type of wing. The cross-vein (b) connecting radius and media is not clearly differentiated, but traceable as a narrow colourless band, with a fleck of dark pigment along either margin about the middle of its course. As there is disagreement in interpreting whether the next following veins are branches of the cubitus or anal veins, I have not tried to homologize them, but have numbered the remaining veins 1–5. It is noteworthy that 1 does not unite with *Cu*.

Fig. 1.



Hemipeplus rodericensis. Hind wing : explanation in text.

The wing of *Hemipeplus* has a considerable resemblance to those of certain Melandryidæ, Cistelidæ, and Cleridæ figured by Forbes *, though not agreeing closely with any. Points of difference are that, in *Hemipeplus*, vein 4 (which is not sharply demarcated) does not definitely unite with 3, so that no complete cell is formed ; and there is also no " wedge-cell " enclosed by veins 2 and 3.

I have mounted one wing of a specimen from North America, determined as *H. microphthalmus* Schwarz, and have also examined the folded wings through the partly opened elytra in examples of several other species. The wing in every case resembles that of *H. rodericensis* in being only as long as the elytron and in the system of folding, and the venation appears the same as far as it can be seen. The wing of *H. microphthalmus* is so delicate and transparent that the venation cannot be distinctly seen in the balsam-preparation; *Cu* and its union with *M* are visible, also the vein corresponding to 3 in fig. 1, but those corresponding to 1 and 2 are not visible.

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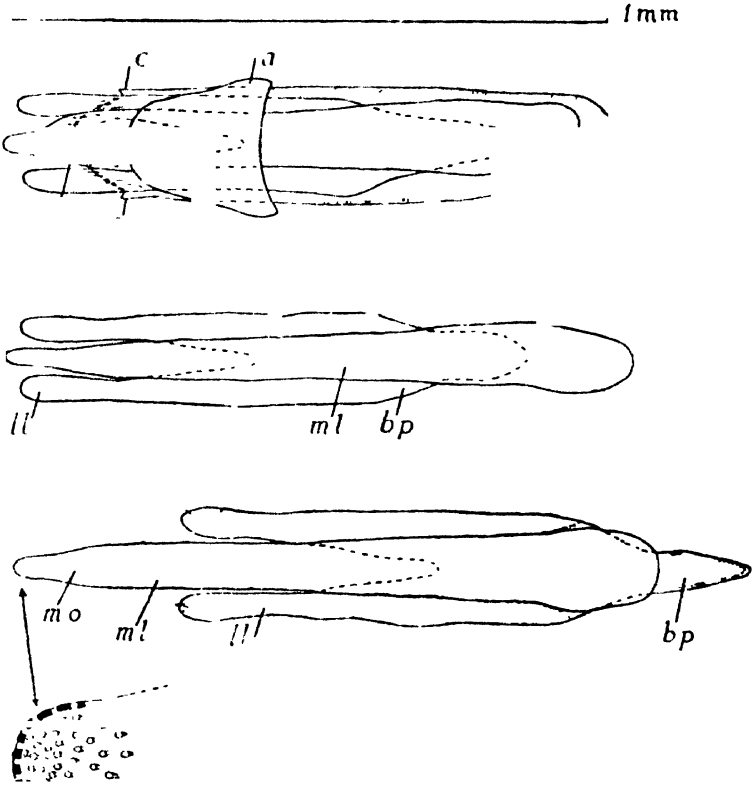
* W. T. M. Forbes, " The Wing-venation of the Coleoptera," Ann. Ent. Soc. America. xv. pp. 328–345, pls. xxix.–xxxv. (1922). The figures to which reference is made are 44, 45, 46, and 48.

This type of wing occurs in many families of the series Diversicornia and Heteromera, so it would be unwise to emphasize an apparent relationship with any particular family.

The **genital armature** of the male has been investigated in *Hemipeplus rodericensis* (seven examples) and in a North American species, *H. marginipennis* Lec. (one example). Its examination has proved difficult, owing to the closeness with which the ædeagus itself is bound up by membrane with certain of the modified body-segments. The examination of balsam-preparations of the whole armature has proved inadequate, and the relations of the component parts, both of the ædeagus itself and the surrounding structures, has been made out by separating them from one another and viewing them under a binocular microscope in different positions during the process of dissection. The form of the segments enclosing the ædeagus is described, but an exact interpretation of their morphology is not attempted.

The following description is drawn up, except where otherwise stated, from *H. rodericensis*. In specimens softened by soaking in water, when the last abdominal tergite (which is slightly chitinized and pigmented, though hidden under the elytra) is lifted away from the fifth (last visible) sternite, a broad flattened chitinous segment, with hairs on its posterior margin, is disclosed; this segment consists of a dorsal and a ventral plate, each considerably shorter than broad, but apparently continuous at the sides, not separated by membrane as a normal tergite and sternite are. Between these two broad plates are two others, a dorsal and a ventral, very much smaller and much modified in shape; the dorsal (fig. 2 A, *a*) is short, with sides sinuate and hind margin widely arcuate, and appears to be attached to the broad dorsal plate by membrane at its base, *i. e.*, the anterior end; it is mostly transparent and colourless, but the lateral margins are chitinized and pigmented; the ventral plate (fig. 2 A, *b*) is very long

Fig. 2.



Hemipeplus rodericensis, ♂. Genital armature.

A, ædeagus and associated modified segments; B, ædeagus with median lobe retracted; C, ædeagus of another specimen, with median lobe exserted (the millimetre line at the top refers to figures A, B, and C); D, tip of the median lobe of the same specimen, more highly magnified, showing the minute circular pores and canals in the chitin. *a*, dorsal modified segment; *b*, ventral modified segment; *c*, *c*, points where *b* appears to be attached to the large ventral segment enclosing it; *d*, pubescent posterior extremity of *b*; *b.p.*, basal piece of ædeagus; *l.l.*, lateral lobes; *m.l.*, median lobe; *m.o.*, median orifice (?).

and narrow, stretching forwards beyond the base of the ædeagus itself; its nearly truncate anterior end is free, and the plate appears to be attached to the broad ventral plate at two points (fig. 2 A, *c*, *c*) near its posterior end; it is colourless and transparent, excepting the pigmented and thickened margin, and the pubescent part like a blunt short tongue (fig. 2 A, *d*), forming its posterior extremity (the pubescent tongue-like portion has not been discerned in the single preparation of *H. marginipennis*).

The *œdeagus* itself lies between these two curiously shaped plates, and consists of a median lobe and tegmen. The *median lobe* (figs. 2 B, C, *m.l.*) is elongate, tapering gradually from the broader bulbous anterior end to near the posterior end, where it narrows more suddenly to a blunt extremity; the bulbous anterior end is paler and less pigmented; no *internal sac* has been made out; there is a less pigmented part ventrally, near the apex, the limits of which are indicated by dotted lines in fig. 2 C, *m.o.*, where the median orifice may be situated; but the actual extremity is covered with minute circular pores, leading into narrow canals, which, in optical section, appear to perforate right through the chitin (fig. 2 D). The *tegmen* consists of a *basal piece* (figs. 2 B, C, *b.p.*) produced into a more or less angular extremity at the anterior end, and continuing (without any line of demarcation) backwards into two long narrow *lateral lobes* (figs. 2 B, C, *l.l.*), with margins slightly sinuate towards the hind ends, which are bluntly rounded; their extreme hind ends are covered thickly, and the surface near them more sparsely, with minute circles (apparently shallow pits in the chitin). There is no articulation of tegmen with median lobe, they are connected only by membrane. No part of the tegmen forms a complete ring round the median lobe, which is free dorsally: the basal piece lies ventral to the anterior end of the median lobe, and the lateral lobes slope dorsalwards, so that their ends to some extent ensheath the median lobe at the sides (in *H. marginipennis*, especially, each lateral lobe appears to be doubled on itself; the general arrangement of the ædeagus and surrounding segments is closely similar in this species to that in *H. rodericensis*, but there are differences, which may be regarded as no more than specific, in the form of the parts).

This ædeagus seems to resemble most that of certain Œdemeridæ. In Sharp and Muir, "The Comparative Anatomy of the Male Genital Tube in Coleoptera" (Trans. Ent. Soc. Lond. 1912), the figure (pl. lxx. fig. 181) and the description of the organ in *Oncomera femorata* F., except for the bending upwards of the basal parts of median lobe and tegmen, correspond fairly closely with the ædeagus of the Hemipeplidæ. The amalgamation of the lateral lobes on the ventral aspect caused Sharp and Muir (*op. cit.* p. 618) to include Œdemeridæ in their series Cucujoidea. They also state (*op. cit.* p. 605) that in the Cucujoidea the median lobe is generally tubular and the first connecting membrane (between tegmen and median lobe) long, allowing a large amount of play to the median lobe through the tegmen; the condition in Hemipeplidæ agrees with this, the degree of freedom of the median lobe being illustrated in figs. 2 B, C, where it is shown retracted, and pushed outwards (*i. e.*, backwards) so that its apex is far beyond that of the lateral lobes.

If the pale ventral area near the apex of the median lobe in Hemipeplidæ is actually the median orifice, its ventral position also agrees with that of this aperture in *Oncomera*, as given by Sharp and Muir, and as it appears to be in the dried preparation from which their drawing and description were actually made. I am not certain, however, if the pale area in Hemipeplidæ is an actual opening, or what is the function of the minute pores in the chitin, visible not only in balsam-preparations made from *H. marginipennis* and *H. rodericensis*, but also in the dried preparation of the ædeagus of *Oncomera femorata* *.

[NOTE.—♀. Since there is no outward distinction between the sexes, several ♀ examples have been accidentally dissected in the hope of their proving to be ♂, and parts of the organs have been mounted after treatment of the abdomen with potash. The most conspicuous object is a long, curved, chitinous rod, ventral and longitudinal in position, evidently the "Kloakstiel" of F. Stein. This is present in examples of *H. rodericensis*, of *H. marginipennis* Lec. (North America), of *H. dollmani* (North-West Rhodesia), and in the unique type of *H. insignis* Arrow (East Africa). In one preparation of *H. dollmani* the rod stretches from about the middle of the last (fifth) sternite forwards nearly to the middle of the third. The "Kloakstiel" is shown by Stein to serve for the attachment of important groups of retractor muscles; its morphology etc. are dealt with by him at length (F. Stein, "Die weiblichen Geschlechtsorganen der Käfer," Berlin, 1847, p. 18 *sqq.*). No deduction as to affinities can be made from the presence of this rod, which is present in all beetles with a long tubular cloaca.]

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* So far as can be seen under the highest power that can be used on the dried and carded preparation of the ædeagus of *Cucujus mniszechi* Grouv. made by Sharp and Muir (*op. cit.* pl. lviii. fig. 97), similar pores appear to be present at the apex of the median lobe.

HEMIPEPLUS Latr.

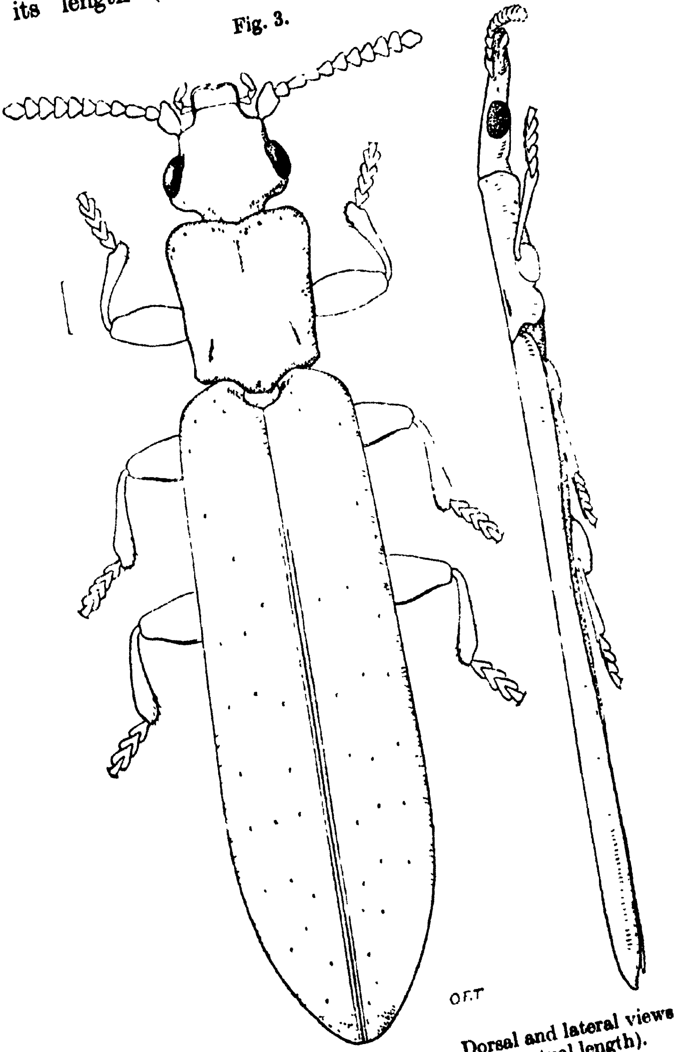
As stated above, there are small structural differences among the species of this genus, which may characterize groups of species but which do not appear important enough for the genus to be divided into two or more genera. Thus, some of the American species have the elytra truncated, so that the pygidium is exposed; in other American species, and in some of the Old World species (including that described below), the elytra completely cover the abdomen, so that no part of the pygidium is visible; and in others again (Old World species) a very small part of the pygidium projects beyond the elytra. It has been considered a generic character that the front coxal cavities are completely closed behind, but this is not always the case. In *H. rodericensis* there is a considerable gap, behind each coxa, between the apex of the narrow prosternal process and the lateral piece (epimeron ?) of the prothorax; but in a specimen of *H. marginipennis* before me the epimera almost touch one another in the middle line, and they are also almost contiguous with the apex of the prosternal process.

Hemipeplus rodericensis, sp. n.

Chocolate-brown, with legs, basal part of antennæ, and most of the mouth-parts yellowish-brown. Form extremely flattened. Surface minutely and closely punctate, and on head and prothorax also minutely reticulate.

Head broadest across the eyes, its breadth slightly more than its length (excluding the labrum). Prothorax

Fig. 3.



Hemipeplus rodericensis, sp. n. Dorsal and lateral views (the line at the side represents the actual length).

a little longer than broad, broadest across the front, with sides converging towards the hind angles, where the breadth is about one-fifth less than at the front angles. Scutellum markedly transverse. Elytra nearly three times as long as their greatest breadth, broadest behind the middle, their hind ends forming a single curve and completely covering the pygidium. Length 6–7 mm.

Colour uniform chocolate-brown, the scutellum and middle part of the elytra rather lighter in some specimens; the extreme front of the head and labrum, mandibles (except their apices) and palpi, basal part of antennæ, and the legs yellowish brown. Surface only slightly shining, covered with very minute, short, pale, decumbent hairs. The general form is extremely flattened, this applying to head, prothorax, and elytra. *Head* broadest across the middle of the eyes, where its breadth is rather greater than its length (excluding the labrum) *; behind the eyes the sides slope steeply and the outline is rounded; neck narrow; there are vague depressions on either side behind the bases of the antennæ, and a slight elevation close to the inner margin of the eye; surface (under a high power) minutely reticulate, puncturation very fine, close and confluent. Eyes moderately large. Antennæ with basal segment produced at the inner distal angle; second segment small, about as broad as long; third considerably longer than broad and about one-and-a-half times as long as second; the following segments are progressively shorter, ninth and tenth considerably broader than long. *Prothorax* broadest across the front, where the breadth is a little less than the length; sides slightly sinuate before the middle, converging gradually towards the hind angle, where the breadth is about one-fifth less than it is across the front; base produced backwards in the middle; front margin elevated, sinuate in the middle, front angles rounded, hind angles obliquely truncated; there is a deeply impressed groove, lying obliquely, on either side of the disc in front of the hind angle, and becoming narrower and shallower from the hind to the front end; surface (like that of the head) minutely reticulate, with very close fine punctures and several vague larger punctures on either side, round the front angle, just within the margin. *Scutellum* markedly transverse, almost crescentic. *Elytra* nearly three times as long as the greatest breadth of the two combined, broadest behind the middle; behind the point where they are broadest they curve inwards to a blunt hind end, which completely covers the pygidium; widely arcuate at the shoulders, and sloping nearly vertically at the sides, the edge between the flat dorsal and deflexed lateral parts being rounded, and the actual margins finely reflexed; a fine sutural stria on either elytron extends from the apex forwards through more than three-quarters of the length; the surface is different from that of the head and prothorax, the minute reticulation is absent, the very close and fine punctures are not confluent, and in certain aspects they give the surface a roughened appearance; there are several series of vague larger punctures, widely spaced, on the flat part of either elytron. *Under surface* minutely reticulate, finely punctured, the punctures very close on the abdomen, less so in the middle of the thoracic sterna; the sterna are glabrous, the abdominal sternites, especially the hinder ones, bear fine decumbent pubescence.

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* In fig. 3 the head appears even shorter, owing to its sloping downwards.

Loc. Rodriguez Island: from leaves of *Pandanus* (see above, under "Biology"), viii.–xi. 1918, 29 examples, consisting of 7 ♂♂, 5 ♀♀, and 17 the sex of which has not been determined (*H. P. Thomasset* and *H. J. Snell*).

Type and paratypes in the British Museum.

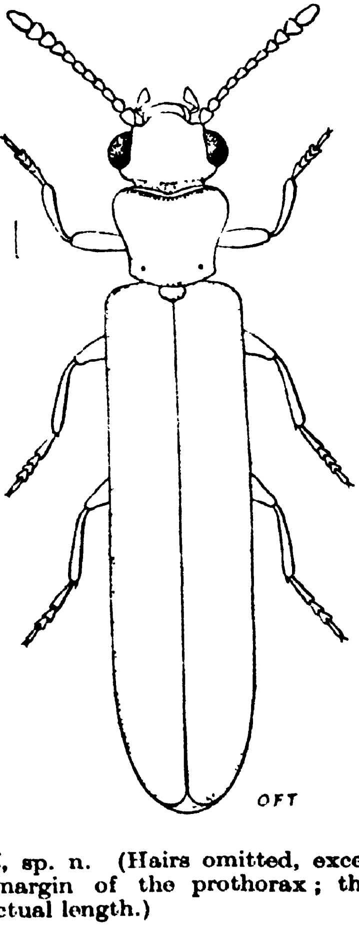
This species does not closely resemble any other. In size and in having the pygidium entirely covered by the elytra it agrees with the unique example of *H. egregius* Arrow (Tanganyika Territory), but the latter is less dark in colour, has the head much more transverse and the eyes very much larger, the prothorax a very different shape (see Arrow, *op. cit.* 1930, p. 227, fig. 1), longer pubescence, etc. *H. madagascariensis* Grouv. is about the same length, but, according to M. Lesne, who has kindly compared examples of *H. rodericensis* with the unique type of *H. madagascariensis* at Paris, the two are quite distinct; *H. madagascariensis* has the prothorax broader than long and very strongly dilated in front, and presents other points of difference. *H. alluaudi* Grouv. (East Africa), *H. africanus* Grouv. (West Africa), and *H. suturalis* Grouv. (Spanish Guinea), are all much smaller and differ from *H. rodericensis* in other respects.

Hemipeplus dollmani, sp. n.

Form long, narrow, and depressed. Colour testaceous, the middle part of the disc of the elytra appearing even paler. Prothorax cordiform, nearly as long as broad, scarcely as broad as the head, with front margin sharply elevated and reflexed; the two foveæ near the hind angles are punctiform, not drawn out into elongate impressions; and the prothorax is not produced backwards into a lobe in the middle at the base. Elytra nearly parallel-sided, about four times as long as the breadth of the two combined, broader at the shoulders than the greatest breadth of the prothorax, with their posterior extremities separately rounded and leaving a very small part of the pygidium visible. Length ca. 3·75–4·75 mm.

Colour testaceous; the elytra are translucent, so that the disc appears mostly very pale straw-colour, while the basal part, deflexed lateral portions, and apices appear darker; head, antennæ, and prothorax yellowish- to reddish-testaceous, femora about the same, tibiæ and tarsi a little lighter. Surface moderately shining, with pale decumbent pubescence of moderate length. *Head* broadest across the eyes (which are fairly large and prominent), its greatest breadth considerably more than its length (excluding the labrum), narrowing markedly behind the eyes; surface slightly convex, with an elevated transverse reticulation, and extremely fine punctures in the interspaces. Antennæ with basal segment not angularly produced on the inner side at the distal end, second rather large, its greatest breadth about equal to its length, third to eighth all distinctly longer than broad (though the eighth is broader than the preceding segments), breadth of the ninth and tenth at the distal end about equal to their length, eleventh considerably longer than broad. *Prothorax* cordiform, reaching its greatest breadth a little behind the front; its greatest breadth slightly less than that of the head across the eyes; about one-seventh to one-eighth broader than long, and with the greatest breadth more than one-and-a-third times the breadth at the base; front angles quite rounded off, hind angles more definite but obtuse; front margin sharply elevated and reflexed, the hairs on it forming an upturned fringe, directed slightly backwards; hind margin not produced backwards into a lobe in the middle; basal foveæ deep, but punctiform, not elongate; surface reticulate, but the spaces are not transverse and the ridges are less elevated than

Fig. 4.



Hemipeplus dollmani, sp. n. (Hairs omitted, excepting those on the reflexed front margin of the prothorax; the line at the side represents the actual length.)

on the front of the head. *Scutellum* transverse, but not so broad in proportion to its length as in some species. *Elytra* nearly parallel-sided, about four times as long as the breadth of the two combined; their breadth at the shoulders considerably more than the greatest breadth of the prothorax; shoulders widely rounded, posterior extremities separately rounded, leaving a very small part of the pygidium visible; dorsal part of elytra very slightly convex, the deflexed lateral parts nearly vertical, the edge between the dorsal and deflexed lateral parts being definite but not carinate; no definite sutural stria; puncturation close and fairly strong, the punctures are seen under a high power to be separated by distances equal to their own diameter, or rather more; interspaces smooth, not reticulate, but slightly thickened longitudinal lines are faintly indicated on the disc.

Type and paratypes in the British Museum.

Loc. North-West Rhodesia: Lukendo, 27. viii. 1913, 1 example, with the record "mopani bark" (*Copaifera mopani*); Nama-ula, 28. viii. 1914, 4 specimens (including type) labelled "in newly built hut"; same locality, without bionomic notes, three specimens dated respectively 1, 2, and 16. ix. 1914 (all *H. C. Dollman*). Belgian Congo: Lunda, "in hut," two examples dated respectively 20. v. and 20. vi. 1929 (*H. Silvester Evans*).

This species is named after the late Hereward C. Dollman.

Specimens have been submitted to M. Lesne, who reports that they resemble the type of *H. africanus* Grouv. (a species described from Gaboon and subsequently recorded from Spanish Guinea) in not having the prothorax produced into a lobe in the middle of the base, but that the pronotum of *H. africanus* is shorter, more sharply dilated in front, and devoid of a reflexed front margin. *H. dollmani* is also about the same size as, and has a considerable resemblance to, *H. alluaudi* Grouv. (one of the original specimens of which, from the East African coast, has been lent to me), but differs as follows:—the colour of *H. dollmani* is much lighter, its head slightly more convex between the eyes, its prothorax narrower (in *H. alluaudi* the prothorax is considerably broader than long); the elevated reflexed front margin of the prothorax is absent in *H. alluaudi*, and the two basal foveæ, smaller and punctiform in *H. dollmani*, are larger and vaguely elongated in *H. alluaudi*.

HOLOPEPLUS Arrow, Ann. & Mag. Nat. Hist. (10) v. p. 230, fig. 2 (1930).

Holopeplus cubensis Arrow, *l. c.*

? = *Hemipeplus gundlachi* Grouvelle, Ann. Soc. Ent. France, (5) viii. p. 267, pl. viii. fig. 11, and Bull. p. xliv (1878); id. *op. cit.* lxv. p. 197 (1896).

The genus *Holopeplus* was erected by Arrow to include a species represented by a male example and a fragment of a female from Cuba. The chief differences between *Holopeplus* and *Hemipeplus* lie in the great elongation of the head and prothorax and their more convex form, together with the prolongation of the front part of the pronotum and the angulation of the pygidium, in *Holopeplus*. It is doubtful whether *Holopeplus cubensis* Arrow is not identical with *Hemipeplus gundlachi* Grouvelle, the latter of which was also based on a specimen from Cuba. Since only one entire specimen of the former is known, and only a single example, preserved in the Paris Museum, of the latter, comparison of actual specimens is impossible. M. Lesne, who has kindly compared Grouvelle's type of *Hemipeplus gundlachi* with Arrow's figure of *Holopeplus cubensis*, reports that the two are undoubtedly closely alike, but that slight differences are perceptible, which may indicate distinct species. The possibility that these differences are secondary sexual characters cannot, however, be excluded. In any case Grouvelle's species must be removed from *Hemipeplus* to *Holopeplus*, while the question whether *cubensis* is identical with it must be left open.

LX.—*Oxford University Expedition to Hudson's Strait, 1931: Diptera Nematocera. With Notes on some other Species of the Genus* Diamesa. By F. W. EDWARDS, M.A., Sc.D., British Museum (Natural History).

THE Nematocerous fauna of Akpatok Island, as represented in the Oxford University collection, is chiefly interesting in the following respects:—(1) the occurrence of four hitherto undescribed species of *Diamesa* ; (2) the occurrence of no fewer than four species of *Simulium* ; (3) the entire absence of Tipulidæ. The proportion of circumpolar species is apparently not so great as might have been expected.

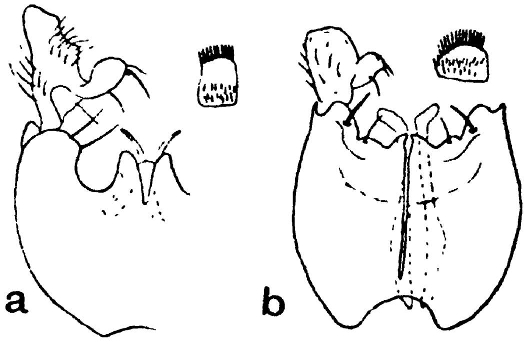
Mycetophilidæ.

Boletina arctica Holmgr., var. (Fig. 1, a.)

Bog margin, valley head, 25. viii. 31, 1 ♂ ; plateau, dip wet from recent snow, 28. viii. 31, 1 ♂ (*Davis*).

A small black species with bare pleurotergites ; antennæ and palpi all black ; four posterior coxæ mainly black ; front coxæ, all femora, tibial spurs, and halteres yellow ; outer claw of front tarsi thickened but not conspicuously so.

Fig. 1.



Hypopygium from beneath, with one anal cercus.
a. *Boletina arctica* Holmgr., var. ; **b.** *B. akpatokensis*, sp. n.

The hypopygium (fig. 1, **a**) agrees in most respects with Lundstroem's figure. Sternite divided for a short distance only ; parameres short and sharply pointed ; anal cerci each with one regular comb at the tip and two very irregular combs at the base.

In Lundstroem's figure the style is shown as having a more regular outline on the distal part, with smaller basal internal process. This is the condition in a male from Greenland kindly lent by Dr. Lundbeck.

Boletina akpatokensis, sp. n. (Fig. 1, **b**.)

Bog margin, plateau, c. 600 ft., 4. ix. 31, 12♂♂ (*Gregson*); bog margin, valley head, 25. viii. 31, 1 ♂ (*Davis*).

Closely resembles *B. arctica*, differing mainly if not solely in the ♂ hypopygium (fig. 1, **b**), which has the sternite divided almost to the base in the middle line, parameres long, with flattened and somewhat rounded tips, style differently shaped, etc.

Cœlosia truncata Lundst.

Bog margin, plateau, c. 600 ft., 4. ix. 31, 1 ♂ (*Gregson*).

A North European species, not hitherto recorded from North America, and not known in Spitsbergen, where the genus is represented by *C. tenella* Winn. (*setipennis* Holmgr.).

Culicidæ.

The collection includes eleven mosquitoes, all females in bad condition, and therefore not determinable; apparently two species are represented, both belonging to the group of *Aëdes* (*Ochlerotatus*) *nigripes* Zett.

Simuliidæ.

The collection includes examples of four species of Simuliidæ, only one of which I am able to name with certainty; the other three may be known North American forms, but I cannot determine them with the keys in Dyar and Shannon's recent revision.

Simulium vittatum Zett.

In tent, 31. viii. 31, 1 ♀; rough valley slope, 29. viii. 31, 2 ♀♀ (*Davis*).

The occurrence of this widely distributed northern species was to be expected; it occurs in Greenland, and is the only species of the genus known in Iceland.

Simulium (s. str.) sp. indet.

In tent, 31. viii. 31, 38 ♀♀; flying over rough valley slope, 28–29. viii. 31, 5 ♀♀; herbaceous valley slope, 6. ix. 31, 1 ♀ (*Davis*); bog margin, plateau, 600 ft., 4. ix. 31, 1 ♀ (*Gregson*).

A rather large species apparently closely resembling the North American *S. piscicidium* and the European *S. nölleri* (*subornatum*), but frons slightly shining. By Dyar and Shannon's key it would run down to *S. venustum*, but is larger than that species and probably not the same.

Simulium (s. str.) sp. indet.

Flying over rough valley slope, 29. viii. 31, 1 ♀ (*Davis*).

Belongs to the same group as the last, but is smaller, with tibiæ mainly dark.

Simulium (*Cnephia*) sp. indet.

Ungava Terr., Pt. Burwell, c. 40 ft., 16. viii. 31, 3 ♀♀ (*Davis*).

Apparently related to *S. lapponicum* End., but identity uncertain.

By Dyar and Shannon's key it would run to *S. pecuarum* or *S. dacotense*, which are larger species.

Chironomidæ.

Diamesa davisi, sp. n. (Fig. 2, **a**.)

On boulders in watercourse, 21. viii. 31, 3 ♂♂, 1 ♀ (*Davis*); flying near watercourse in gorge, 20. viii. 31 (*Davis*).

A small species with hairy eyes, and no antennal plume in ♂; almost uniformly dark in colour.

Antennæ practically alike in the two sexes, but (so far as can be seen in the dry specimens) 9-segmented in ♂, 8-segmented in ♀; almost bare, the few hairs being little longer than the antennal diameter; last segment not much swollen and very little longer than second. Palpi quite short, apparently 3-segmented. *Thorax* very little arched above, but postnotum of the usual form, not small and rounded as in *Heptagyia*; pronotum rather small, just divided in mid-dorsal line. Dorso-central hairs uniserial, rather few and short, but arising from distinct punctures. Mesonotum with very slight grey dusting; when seen from in front with slight indications of three darker (less dusted) stripes. *Hypopygium* of ♂ (fig. 2, **a**) large, upturned; tergite large, trilobed, the lateral lobes produced into prominent flaps; no anal point; coxite with very small lobe at base, otherwise simple; style small, with two tiny points at tip. *Legs* long and slender, without obvious hairs; no minute tarsal spurs on front or middle legs; fourth tarsal segment about half as long as third and somewhat shorter than fifth, very little widened, but distinctly bilobed at tip. *Wings* somewhat smoky, especially along veins; venation normal; anal lobe large and approximately right-angled. Wing-length 2·7–3 mm.

This species is very distinct from any others known to me in the form of the male antenna and hypopygium. Three other subarctic species (*hyperboreus* Holmgr., *borealis* Coq., and *ursus* Kieff.) have been described as having the male antennæ non-plumose. I have examined the types of the first two of these and noted that the hypopygium is similar to that of the European *D. culicoides* Heeger, to which they are evidently closely allied; the published figures of *D. ursus* Kieff. seem to indicate that this also is related to *D. culicoides*.

In its reduced and plumeless male antennæ and very slightly arched mesonotum the new species approaches *Heptagyia*; I prefer to leave it in *Diamesa* on account of the presence of dorso-central hairs and the form of the postnotum.

Diamesa clavata, sp. n. (Fig. 2, **b**.)

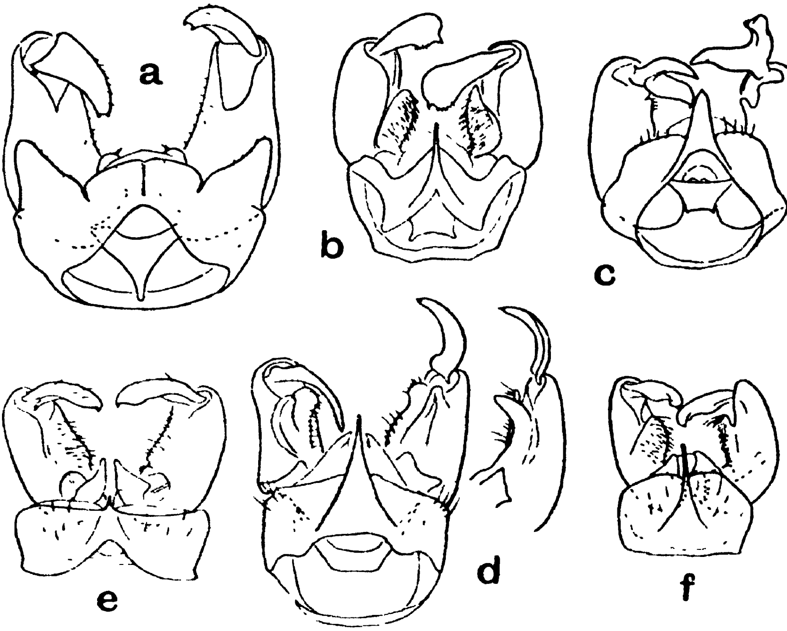
Flying over and near stream, valley head, 3. ix. 31, 1 ♂; 7. ix. 31, 1 ♂, 1 ♀, types (*Gregson*); damp cleft, gorge cliff, 24. viii. 31, 4 ♂♂ (*Davis*).

A blackish species with hairy eyes and well developed antennal plume in ♂, closely resembling others of Group A.

A. R. about 1·5. Palpi of normal length. *Thorax* (as seen from in front) with distinct grey interspaces between the usual three blackish stripes; dorso-central hairs well developed, uniserial. Pronotum not distinctly divided. *Hypopygium* (fig. 2, **b**) rather small, with large hairy basal lobe to the short coxite and long but slender anal point; style of distinctive shape, broadened at tip. *Legs* normal; minute tarsal spurs present on all legs; no tarsal beard in ♂; fourth tarsal segment distinctly shorter than fifth and bilobed at tip, but only slightly widened. *Wings* normal for the group; length 3–3·7 mm.

This has much resemblance to the European *D. latitarsis* Goet., differing in hypopygial structure, especially the form of the style.

Fig. 2.



Hypopygia, dorsal view, of *Diamesa* spp.

a. *D. davisi*, sp. n.; **b.** *D. clavata*, sp. n.; **c.** *D. furcata*, sp. n.; **d.** *D. gregsoni*, sp. n. (with coxite and style in another position, showing apical process of former); **e.** *D. aberrata* Lbk.; **f.** *D. chorea* Lbk. (All to same scale.)

Diamesa bohemani Goet., 1932.

Syn.: *Diamesa arctica* (Boh.) Edw., 1922.
Diamesa waltli (Mg.) Edw., 1929.

Flying over and near stream, valley head, 3. ix. 31, 1 ♂. This specimen agrees well with specimens in the British Museum from England, Scotland, and Spitsbergen. When first recording the species from the last-named country I believed it to be identical with Boheman's *D. arctica*; later I found that this was not the case, and suggested that the species might be Meigen's *D. waltli*; more recently Goetghebuer has maintained that *D. waltli* is again a different species, and has introduced the new name *bohemani*, based partly on my previous errors of determination and partly on specimens examined by him from Iceland and Austria. Goetghebuer givesa figure of the hypopygium which he informs me was drawn from an Austrian specimen ; it correctly depicts the structure, as evidenced by another Austrian specimen which he has sent to me, but there are some noteworthy differences, varietal if not specific, between the Austrian specimens and all the others (from Northern countries) which I have examined. The question arises as to whether the name *bohemani* should be applied to the northern or to the central European form; as it was introduced as "nom. n." and not as "sp. n.," I believe I am justified in restricting it to the northern form, and regarding as the type of *D. bohemani* the male from Spitsbergen (in the British Museum) which I figured in 1922

Diamesa zernyi, sp. n.

Resembles *D. bohemani* as restricted above, and possibly only a variety of it, but differs in having the coxite of the ♂ hypopygium shorter, with a conspicuous tuft of hairs at the base on the inner side, this tuft being absent or represented by two or three hairs only in *D. bohemani*.

Type ♂ in the British Museum, from Hainfeld, Lower Austria, 26 iii. 31 (*Zerny*), presented by Dr. Goetghebuer.

Diamesa furcata, sp. n. (Fig. 2, c.)

Flying in swarm over scree in ravine, 14. ix. 31, 2 ♂♂, 7 ♀♀ (*Davis*); in tent, 14. ix. 31, 2 ♀♀ (*Davis*).

A medium-sized black species with bare eyes and almost clear (but not at all milky) wings.

Antennæ of normal form, 14-segmented in ♂, 8-segmented in ♀, A. R. in ♂ about 1·3. *Thorax* (as seen from in front) with narrow grey interspaces between the three blackish stripes, widening into a pair of grey patches in front of scutellum ; dorso-central hairs uniserial throughout. *Hypopygium* (fig. 2, c) rather small. with very stout anal point and with styles of remarkable form, divided almost to the base into two arms which extend almost at right angles with one another. *Legs* normal ; no tarsal beard in ♂ ; fourth tarsal segment markedly shorter than third or fifth, distinctly widened in middle and bilobed at tip. *Wings* normal, length 3·5 mm. Halteres yellow.

The hypopygium of *D. furcata* shows considerable resemblance to that of *Syndiamesa biappendiculata* Goet. of Greenland, as figured by Goetghebuer in 'Faune de France.' It is possible that the species may be the same, and that Goetghebuer overlooked the bilobed tip of the fourth tarsal segment, and so referred his species to *Syndiamesa*.

Diamesa gregsoni, sp. n. (Fig. 2, **d**.)

Flying over and near stream, valley head, 3. ix. 31, 1 ♂ (*Gregson*); in moss, herbaceous valley slope, 25. viii. 31, 1 ♀ (*Davis*).

A black species with bare eyes, much resembling the last, but differing as follows :—

Size larger (wing-length 4–4·5 mm.). A. R. in ♂ about 1·8. *Hypopygium* (fig. 2, **d**) very different ; anal point long, but much more slender ; style with slight enlargement at base only ; coxite with a thumb-like dorsal projection near the tip, conspicuous in side view. Wings with slight milky tinge by reflected light.

This is closely related to *D. arctica* Boh. (*poultoni* Edw.) of Spitsbergen, differing in the form of the coxite of the male hypopygium.

Diamesa aberrata Lundbeck. (Fig. 2, **e**.)

I am indebted to Dr. W. Lundbeck for the loan of a co-type of this Greenland species, which I had thought might prove to be the same as one of those from Akpatok Island.

D. aberrata proves to be a distinct species of Group B (*i. e.*, with bare eyes and no definite milky tinge in the wings). It has a hypopygium very much like the British *D. parva* Edw., with very short anal point, and no definite lobes on the coxite other than the pair of bare flaps arising apparently from the basal membrane (see fig. 2, **e**).

Diamesa chorea Lundbeck. (Fig. 2, **f**.)

Lundbeck also sent me on loan a male co-type of this species, which also proves to belong to Group B, and is very similar in all external characters to the last. I mounted the hypopygium, and give a sketch of it herewith (fig. 2, **f**); it is not unlike *D. arctica* Boh. (*poultoni* Edw.), *D. latitarsis* (Goet.) Edw., and *D. gregsoni*, sp. n., differing from all these in the form of the style.

Metriocnemus ursinus Holmgr. (?).

Bog margin, valley head, 25. viii. 31, 1 ♂, 4 ♀♀; also Pt. Burwell, Ungava Terr., c. 40 ft., 16. viii. 31, 4 ♂♂, 2 ♀♀ (*Davis*).

The Akpatok specimens are smaller than those from Ungava, but both series agree rather closely with Spitsbergen material.

Cricotopus basalis Staeg.

Bog Margin, valley head, 25. viii. 31, 2 ♀♀; also Pt. Burwell, Ungava Terr., c. 40 ft., 16. viii. 31, 1 ♀ (*Davis*).

Cricotopus vitripennis Mg.

Pt. Burwell, Ungava Terr., c. 40 ft., 16. viii. 31, 2 ♀♀ (*Davis*).

Spaniotoma (Psectrocladius) obvius Walk.

Bog Margin, valley head, 25. viii. 31, 9 ♂♂; also Pt. Burwell, Ungava Terr., c. 40 ft., 16. viii. 31, 1 ♀ (*Davis*).

The males are entirely black, without yellow on shoulders, but otherwise agree with British specimens.

Spaniotoma (Orthocladius) oblidens Walk.

Herbaceous valley slope, 6. ix. 31, 2 ♂♂, 1 ♀ (*Davis*); bog margin, valley head, 2. ix. 31, 1 ♂ (*Gregson*); also Pt. Burwell, Ungava Terr., 16. viii. 31, 2 ♂♂, 3 ♀♀ (*Davis*).

Spaniotoma (Orthocladius) frigidus Zett.

Bog margin, valley head, 25. viii. 31, 1 ♀ (*Davis*); flying over and near stream, valley head, 3. ix. 31, 1 ♀ (*Gregson*).

Spaniotoma (Orthocladius) sp.

Bog margin, plateau, c. 600 ft., 4. ix. 31, 3 ♀♀; valley head, 2. ix. 31, 1 ♀, and 3. ix. 31, 1 ♀ (*Gregson*); also Pt. Burwell, Ungava Terr., 16. viii. 31, 2 ♀♀ (*Davis*).

This species is rather peculiar in having a small tooth on each side of the spur of the hind tibia at about the middle; the front tibial spur also has a single very minute tooth in the middle. Similar tibial spurs are found in the British *S.* (*O.*) *dentiforceps* Edw., a fact not noticed at the time the species was described; it is possible that the Akpatok species is related to *S. dentiforceps*, though it is not the same, having a shorter terminal antennal segment.

Spaniotoma (*Smittia*) sp. indet.

Pt. Burwell, Ungava Terr., 16. viii. 31, 1 ♀ (*Davis*).

Chironomus (s. str.) sp.

With the last ; one fragmentary specimen.

Tanytarsus sp.

With the last ; one fragmentary specimen.

LXI.—*Diagnoses of new Genera and Species of Rodents from Indian Tertiary Deposits.* By MARTIN A. C. HINTON, Zoological Department, British Museum (Natural History).

IN preparing a monograph of Indian fossil rodents I have found remains of a number of forms new to science among the material belonging to the Geological Survey of India. Although the Monograph has now been completed, some considerable time must elapse before its publication. It seems advisable therefore to publish the following diagnoses :—

Family **Muridæ.**

Subfamily *RHIZOMYINÆ.*

Protachyoryctes tatroti, gen. et sp. n.

Lower jaw and incisor essentially as in *Tachyoryctes* ; jaw very lightly built ; incisor very slender.

Cheek-teeth relatively low-crowned, their crown structure more complex than in recent *Tachyoryctes*, essentially as in the more primitive species of *Rhizomys* (e. g., *R. sivalensis* Lydekker). Measurements :—Lower incisor, width 1·6 mm., depth 2·3 ; length of tooth-row m_1–m_3 10 mm., width of $m._2$ in front 3·0.

Type and Type-horizon.—An imperfect right mandibular ramus, no. D. 272, from the Middle Pliocene, Tatrot Stage near Tatrot, Salt Range, Punjab.

RHIZOMYS.

Five species referable to this genus are represented in the material before me. Their characters may be keyed as follows :—

A. Lower incisor comparatively slender, its width less than 4 mm. Mandible rather lightly built ; horizontal ramus shallow.

General character of jaw resembling that of recent *R. badius*.

a. Size small; length of mandibular cheek-tooth row 10 mm.; width of lower incisor 2·8 mm. .... ***R. nagrii***, sp. n.
Upper Miocene; Nagri Stage. (Type :—D. 273; from Haritalyangar, Simla Hills.)

b. Size medium; length of mandibular cheek-tooth row 14·4 to 16 mm.; width of lower incisor 3·1 to 3·7 mm. .... ***R. sivalensis***, [Lydekker.
Upper Miocene; Nagri Stage. (Co-types :—D. 274–276; from Hasnot, Punjab.)

B Lower incisor robust from 4·5 to 6 mm. in width.

c. Mandible not specially modified, nearly as in *R. nagrii* and *R. sivalensis*.

1. Size medium; length of mandibular cheek-tooth row 14·3 mm. .... ***R. pinjoricus***, sp. n.
Upper Pliocene; Pinjor Stage. (Type :—D. 279; from Moginand, Simla Area.)

2. Size large; length of mandibular cheek-tooth row 19 mm. .... ***R. lydekkeri***, sp. n.
"Lower Siwaliks," Pliocene (?). (Type :—B.M. no. 15925; Cautley Collection, locality unknown.)

d. Mandible heavily built; horizontal ramus deep (least depth below m_3 15·5 mm instead of less than 12·5 mm.). General character of jaw nearly as in recent *R. sumatrensis*. Mandibular cheek-tooth row 14·5 mm. long .... ***R. pilgrimi***, sp. n.
Upper Miocene; Nagri Stage. (Type :—D. 278; from Haritalyangar, Bilaspur, Simla Hill States.)

Colbert (Amer. Mus. Nov. no. 633, June 10, 1933, p. 1) has recently described a new species, *R. punjabiensis*, from Lower Siwalik beds "at a point near the Sutlej River, about twenty-three miles west and north of Bilaspur, Bilaspur State, Punjab." This is a smaller species than any of those represented in the material before me; the length of the mandbiular cheek-tooth row can scarcely exceed 7·5 mm.

Family **Hystricidæ**.

Subfamily *CAPROMYINÆ*.

Paraulacodus indicus, gen. et sp. n.

Upper incisor grooved, much as in recent *Thryonomys*, but deeper than broad instead of broader than deep; anterior face with a broad median costa and two grooves, one on each side, the margins of the tooth not swollen up as in *Thryonomys*. Cheek-teeth $\frac{4}{4}$; the upper premolar not reduced. Crown-structure essentially as in *Thryonomys*, but crowns of a markedly more brachyodont type. Lower incisor without grooves or costæ. Measurements :—Upper incisor, width 2 mm., depth 3·2 ; $p.^4$–$m.^3$ 8·3 ; $m._1$ length 3·3.

Described from the Middle Miocene (Upper Chinji Stage) of Northern India ; co-types nos. D. 281–283 from below Kookar Dhok, Salt Range, Punjab.

Subfamily CTENODACTYLINÆ.

Pectinator sivalensis, sp. n.

Mandible and cheek-teeth essentially as in recent *P. spekei* ; slightly more robust and cheek-teeth with rather lower crowns developing roots earlier than in the existing species. Measurements :—length of $m._2$–$m._3$ together, at bases, 4·7 mm.

Described from the Middle Miocene (Chinji Beds) of Northern India.

Type.—Part of a left mandibular ramus, no. D. 284, from near Chinji, Attock District, Salt Range, Punjab.

Protachyoryctes, *Paraulacodus*, and *Pectinator sivalensis* are of considerable interest as representing genera which are now confined to the African Continent. It is worth noting that a fragmentary jaw from the Chinji Beds, no. D. 271, represents a species apparently indistinguishable from members of the European tertiary genus *Theridomys*.

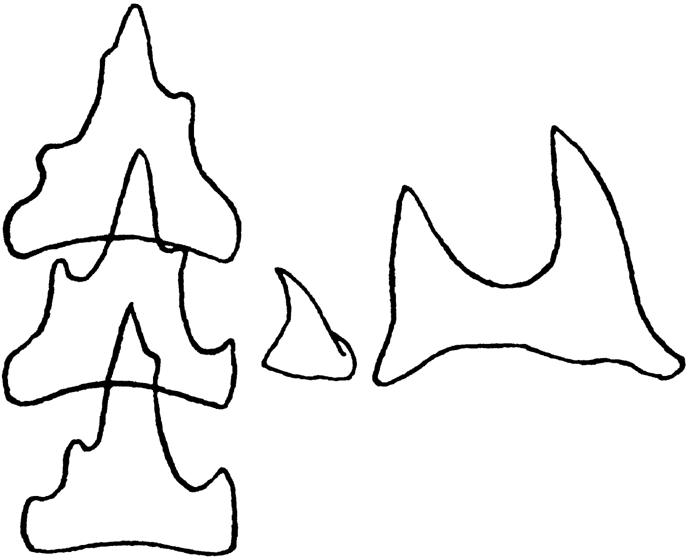
LXII.—*Notes on the Cephalopoda.*—XVIII. *On a remarkable Form of Radula in the Genus* Graneledone. By G. C. Robson, M.A., F.L.S.

In his report on the 'Albatross' (1891–1900) collection of Cephalopoda, Hoyle (1904, p. 21) recorded three specimens of *Eledone* from 1020 fathoms off Cape Mala (Panama), which he referred to Verrill's *Eledone verrucosa* from N.E. American waters. He did not describe the specimens in detail, alluding only to two rather unimportant features (the size of the eyes and the ocular tubercles) in which they differed from the type-specimen. In reviewing the genus (1932, p. 309) I expressed considerable doubt as to the validity of Hoyle's diagnosis.

In collecting material for a study of the atrophy of the radula in the Octopoda, I recently discovered that there is in the Zoological Department of the British Museum a preparation of the radula of one of the Cape Mala specimens, which had evidently been extracted by Hoyle. It bears his catalogue number (H 95) and the ‘ Albatross ’ number 7940.

This radula (fig. 1) is certainly one of the most remarkable among those of the Cephalopoda. Its essential peculiarity consists in the fusion of the second and third lateral teeth of each side so as to form a single bicusped tooth of large dimensions. In a normal radula of the Octopodidæ (fig. 2) the second lateral has a long, rather narrow base and a terminal or subterminal cusp at the inner (rhachidian) end. The third lateral is a long narrow blade-like tooth with a small base. In the Cape Mala “ *Eledone verrucosa* ” the fusion between these teeth has taken place in such a way that the elongate base of the second lateral is preserved more or less intact, and the third lateral is fused with its outer end, so that two cusps now spring from the one base. The fusion occurs between the teeth in every row and on each side of the rhachis.

Fig. 1.

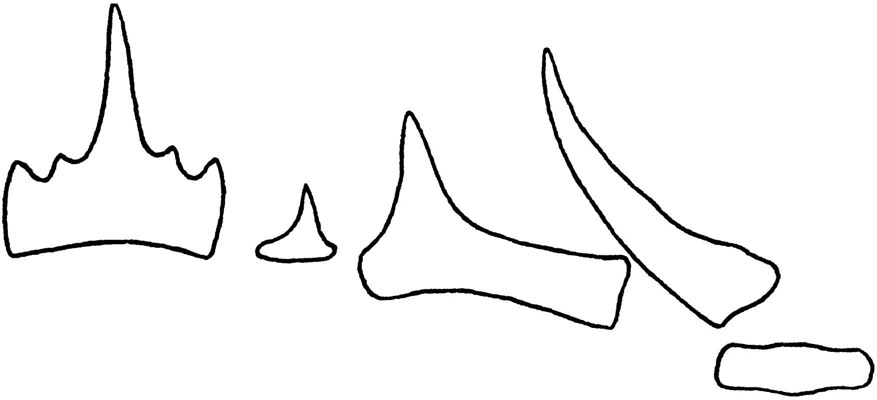


Radula of (?) *Graneledone* sp. (Brit. Mus.). × c. 110.

It is very unfortunate that only one radula of this interesting form is available for study. We do not know if it is that of a single abnormal individual or of a representative of a larger population having this character. I believe, however, that the radula is characteristic of a larger population, as it is very unlikely (though, of course, not impossible) that the trawl would have picked up a unique specimen.

Beyond the atrophy of the radula noted in abyssal forms, and the dropping-out of a whole series of teeth on each side (so that the radula has only 5, not 7, series) in *Gonatus* (Grimpe (1927)), the radula in the Dibranchiate Cephalopods shows very little far-reaching modification. The occurrence of this fusion is not without general interest. On the assumption (which I believe correct) that it is a fixed racial characteristic, its appearance is entirely discontinuous, no other indication of even an approximation to such fusion having been recorded up to date. Fusion of teeth occurring as an individual peculiarity is fairly well known in Gastropods (Peile (1932, p. 103)). Lt.-Col. Peile tells me, however, that according to his experience such fusion is never (as in this instance) symmetrical, *i.e.*, it occurs only on one side of the rhachis. If fusion does occur, it is found throughout a whole series (linear array of homologous teeth from the nascent end forwards). Col. Peile believes that up to three teeth may be found fused. There is among the Gastropoda no case known to us of

Fig. 2.



Radula of *Octopus* sp. (Brit. Mus.). × c. 33.

symmetrical fusion occurring as a permanent characteristic of a species in a genus in which the radula is otherwise normal.

The radula of the Cape Mala *Eledone* exhibits some minor peculiarities, which may be noted. The rhachidian tooth has an asymmetrical cusp-seriation of the type B_6 (Robson, 1929, p. 13), the admedian is relatively large and has a tall cusp. The marginals are evanescent.

As for the systematic status of the animal from which the radula was taken, it is not possible to say much at present. The radula of *Graneledone verrucosa* is unknown. In *Graneledone challengeri* (Robson, 1932, p. 312) it exhibits no fusion and is composed of simple unicuspid teeth of an archaic type with marked reduction of the laterals. In all probability the Cape Mala specimens are representatives of a new genus. Besides the fusion of the teeth, the possession of an asymmetrical cusp-seriation on the rhachidian tooth is an important diagnostic feature, serving to distinguish this form from *Graneledone* and indeed from other members of the Bathypolypodinæ, in which the rhachidian is usually unicuspidate.

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LXIII.—*The Hyrax of the Central Sahara.* By ERNST SCHWARZ. (From the Zoological Department, British Museum, Natural History.)

LAST year * MM. Heim de Balzac and Bégouen described a new species of Hyrax from the Hoggar Mountains, Central Sahara, which they named *Procavia* (*Heterohyrax*) *antineæ*. This form was remarkable in being represented by two mutant phases, a pale and a chocolate one, and claimed to be different from the species previously described from the same general region, *Procavia bounhioli* Kollmann *.

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* Bull. Mus. Hist. Nat. Paris, (2) iv. p. 479 (1932).

In a collection from the Hoggar Mountains, brought together by Colonel R. Meinertzhagen in the early months of 1931, are three specimens of a Hyrax, which he kindly submitted to me for examination. Two of them are chocolate all over, with a slightly paler belly and a pale glandular spot on the back. The third skin, that of a baby, represents the pale phase. It obviously fits the pale phase of *antineæ*, but also clearly represents *bounhioli*. The skulls are evidently those of *Procavia*. The closed orbit is also found in the adjoining races of *Procavia ruficeps*, such as *P. r. marrensis* Thomas & Hinton from Darfur or *P. r. burtoni* Gray from Upper Egypt. The dentition is the same in all of them, as is also the general shape of the skull, the form of the incisive foramina, the flattened basioccipital, which is widely deviating from the compressed type found in *Heterohyrax*, and in many other details which need not be discussed here. There is no doubt, therefore, that, as was to be expected, *antineæ* is a strict synonym of *bounhioli*. Of Colonel Meinertzhagen's specimens two, a dark (no. 100) and the pale (no. 101) one, were shot on the same day (10.3.1931).

The Hoggar Hyrax clearly is the northernmost outpost of a purely Ethiopian type, and a representative of this fauna in a more or less Palearctic surrounding. In fact, the distribution of this form extends much further south. A comparison of the pale Hoggar skin with the type of *Procavia buchanani* Thomas & Hinton †, from Aouderas, Azben, reveals a perfect identity of the two in every detail; *buchanani*, too, becomes synonym of the earlier name. The designation of what should be known as the Sahara Hyrax would have to be *Procavia ruficeps bounhioli* Kollmann.

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* *Op. cit.* (1) xviii. p. 281 (1912).

† Nov. Zool. xxviii. p. 13 (1921).

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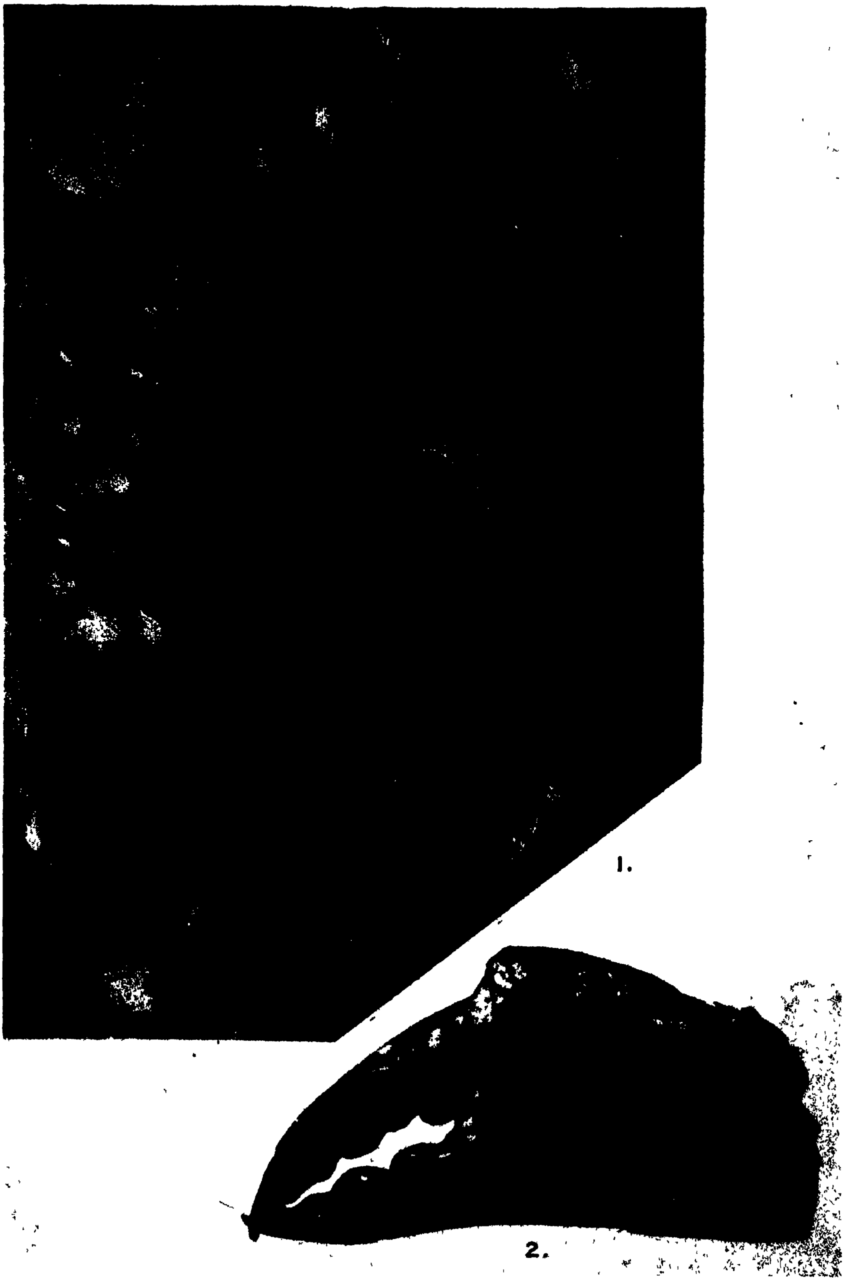

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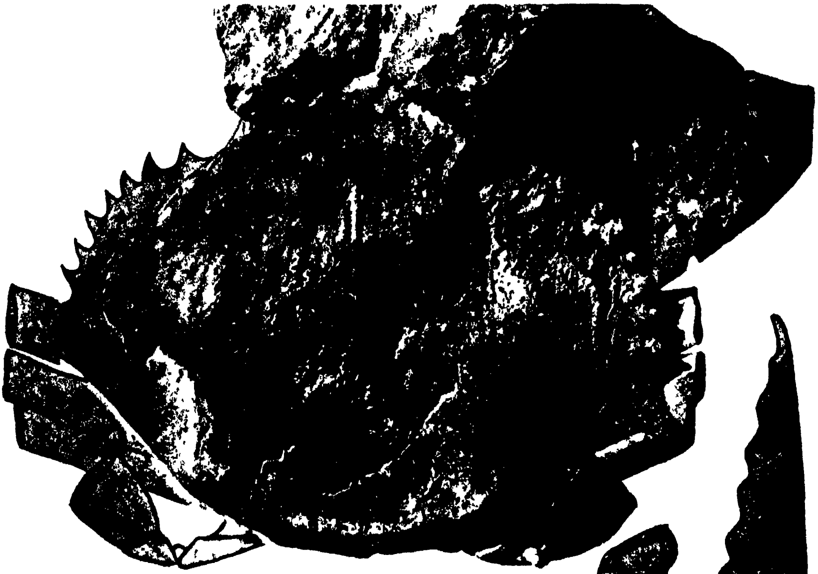

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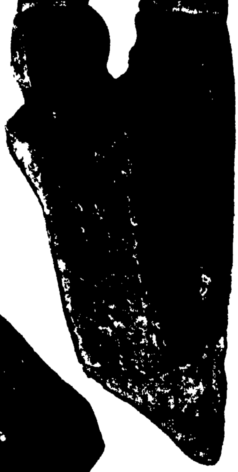

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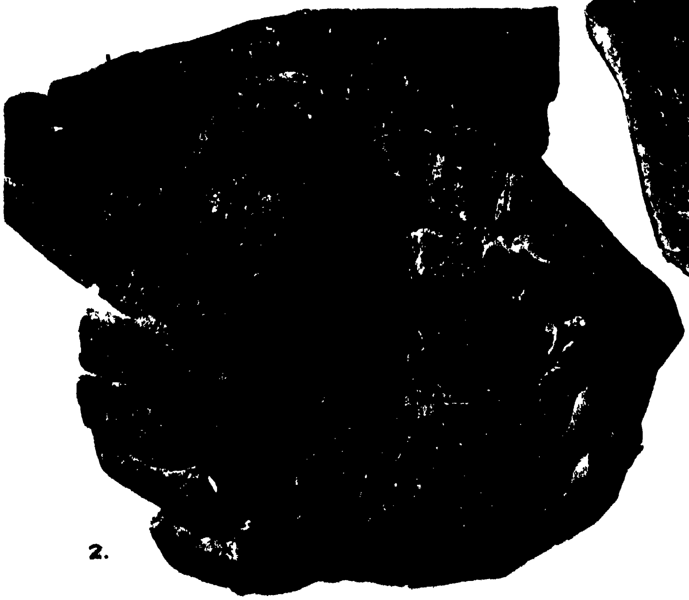

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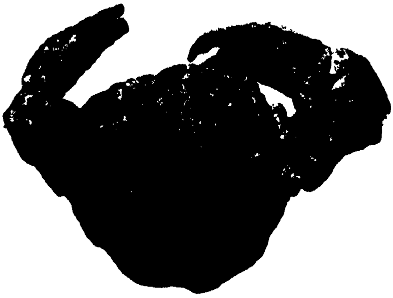

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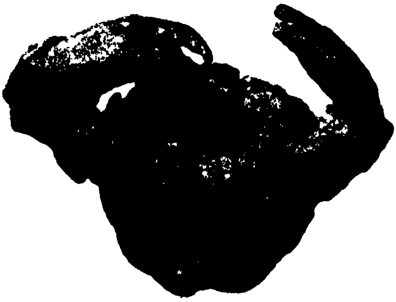

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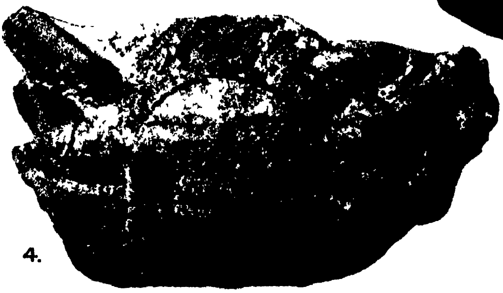

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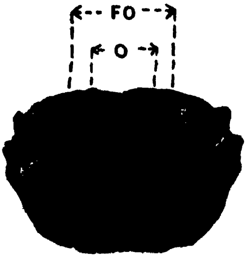

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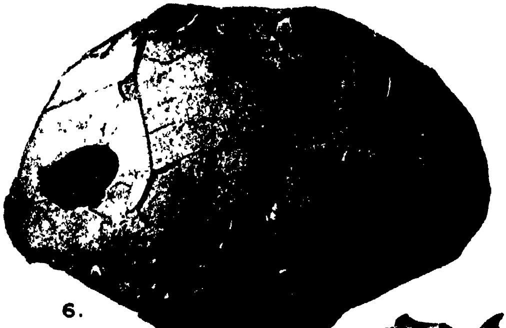

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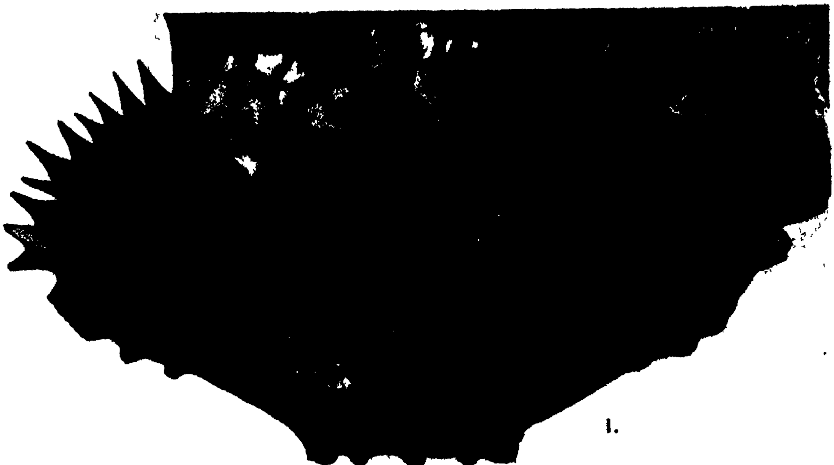

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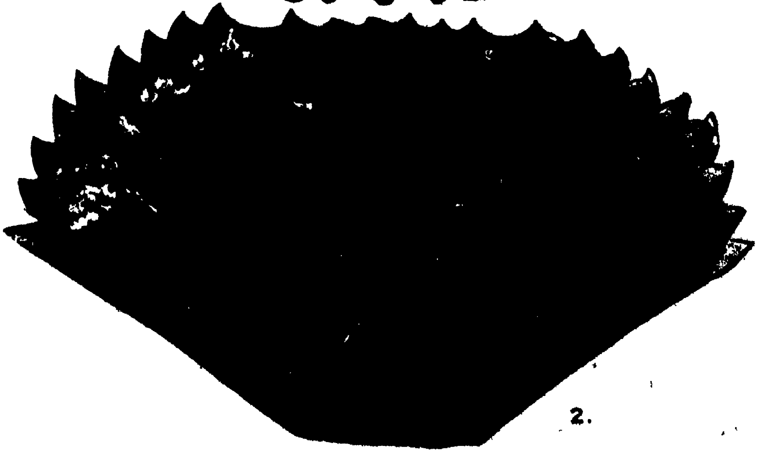

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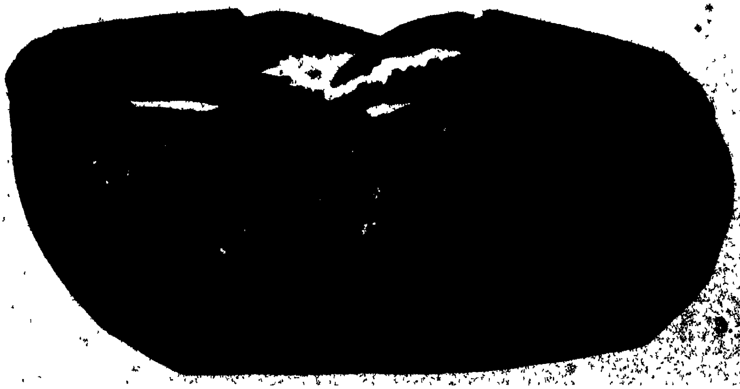
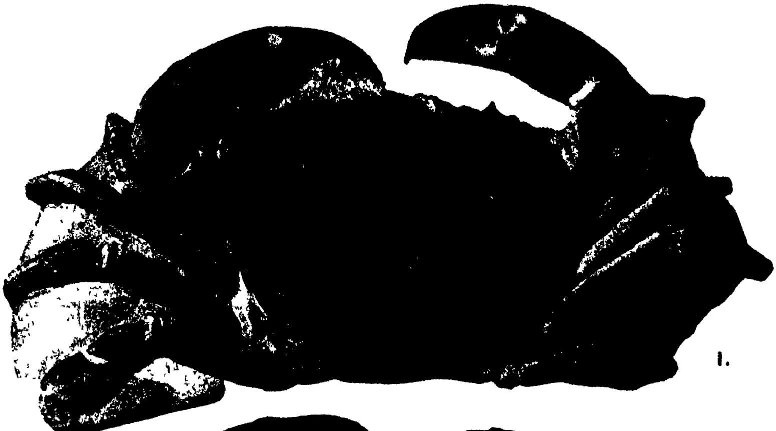


M. F. Glaessner & H. G. Herring photo.



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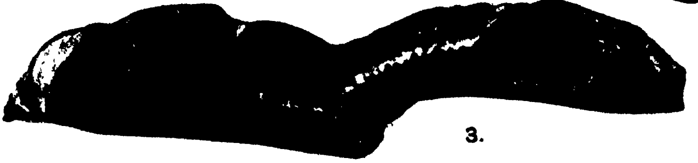

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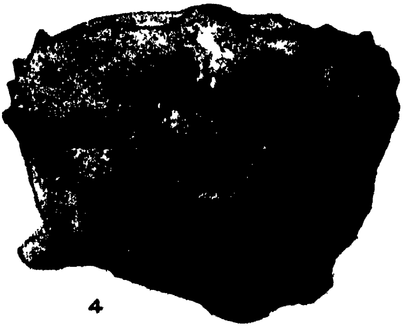

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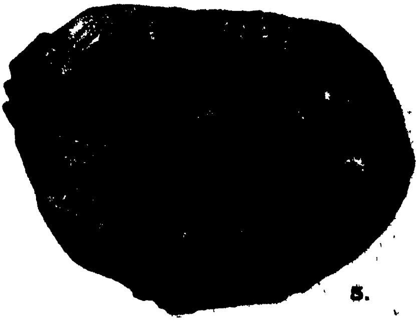

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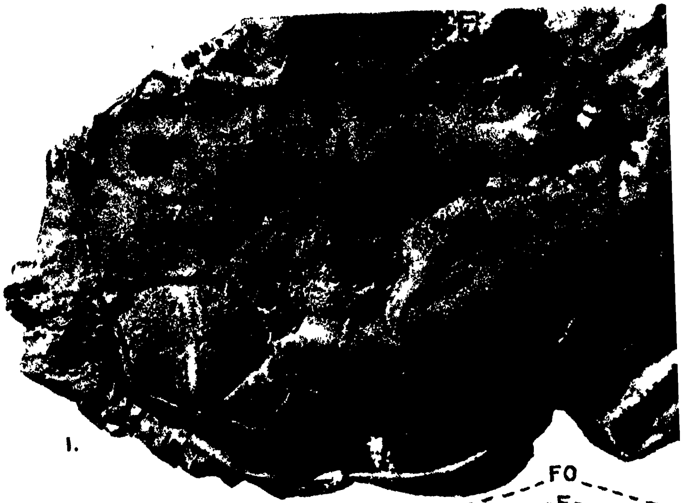
H.G Herring photo



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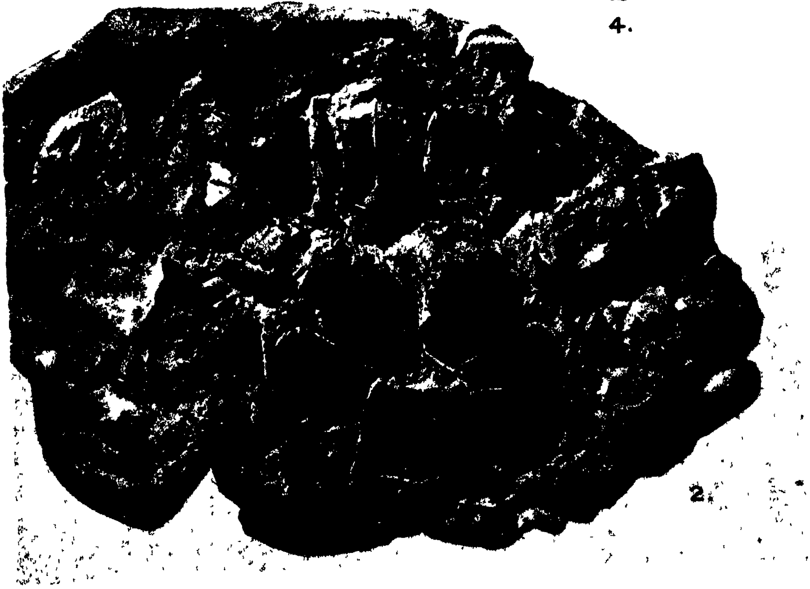
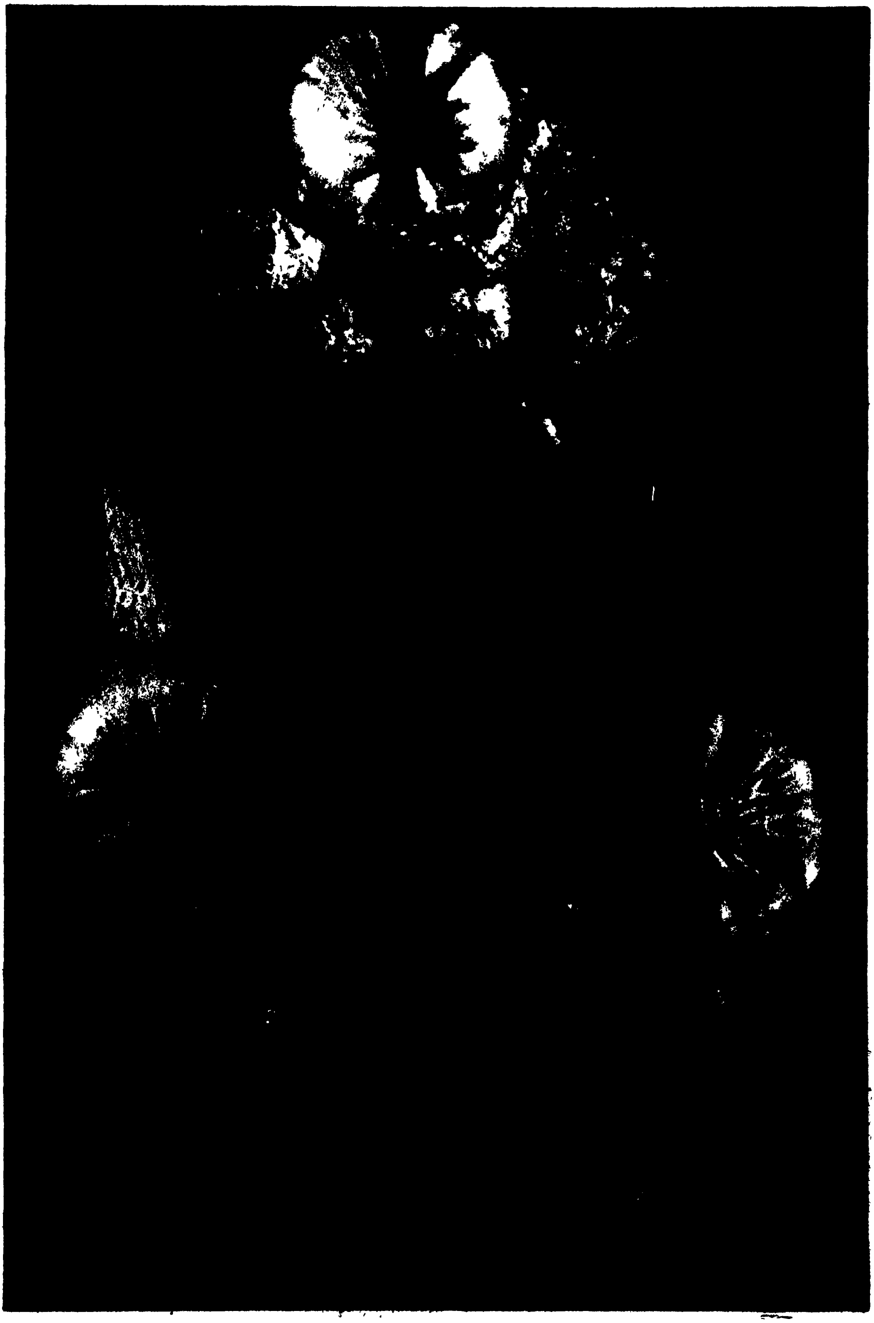


2.

H G Herring photo

TERTIARY CRABS



BALANOPHYLLIA ANNÆ, sp. n.

Ann. & Mag. Nat. Hist. S. 10. Vol. XII. Pl. VIII.

FIG. 4.

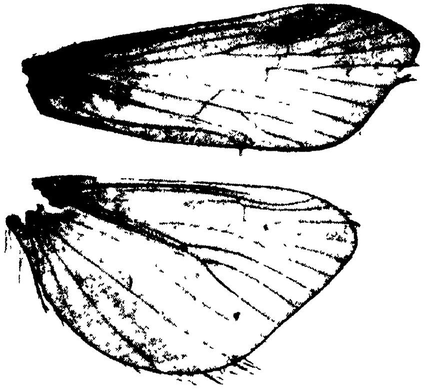
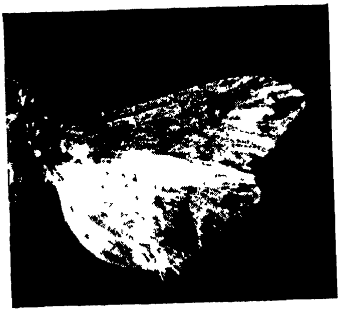
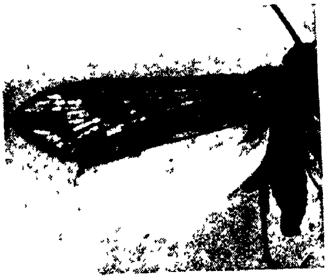


FIG. 5.





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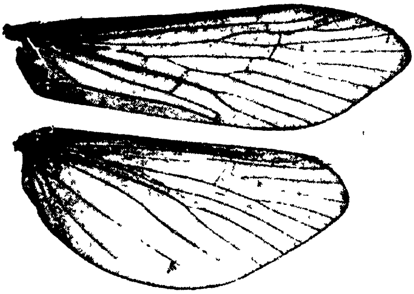
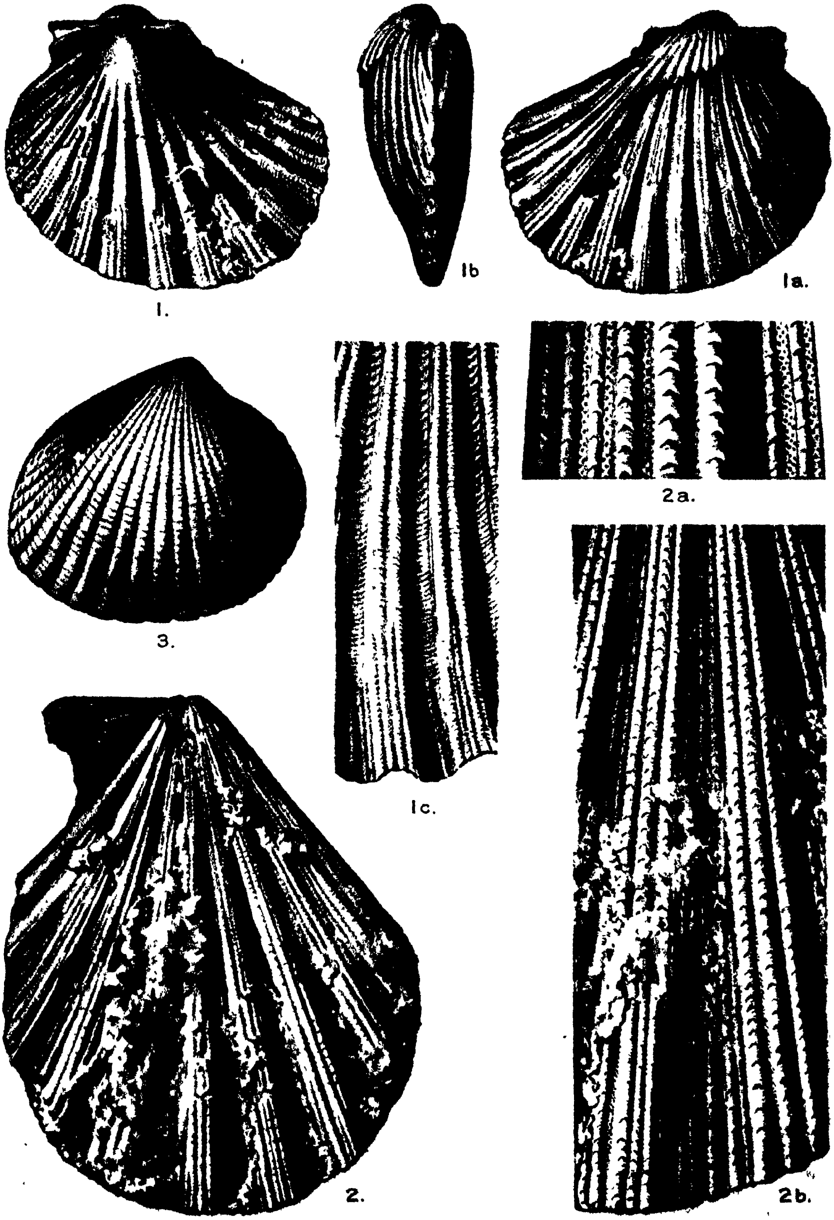


FIG. 2.

Photo M. E M

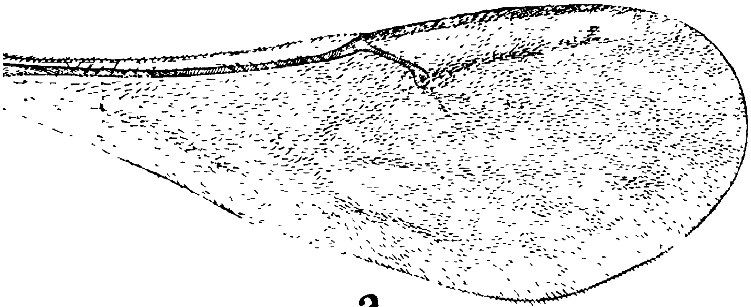
The Genus Smicridea McLach.

Ann. & Mag. Nat. Hist. S. 10. Vol. XII. Pl. IX.



E T Talbot, del

NEW MIOCENE MOLLUSCA FROM THE
CLYPEASTER HORIZON, CYPRUS.



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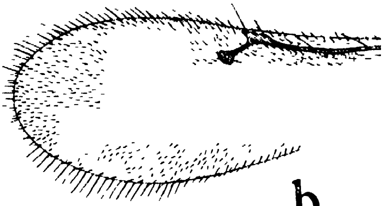

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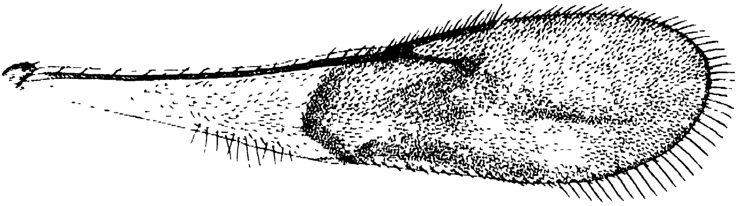

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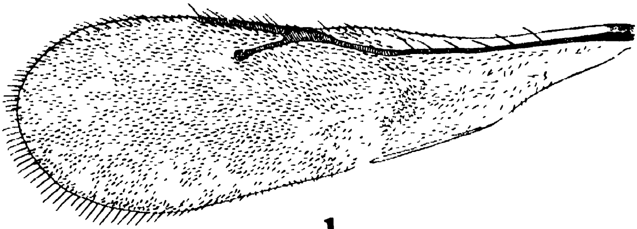
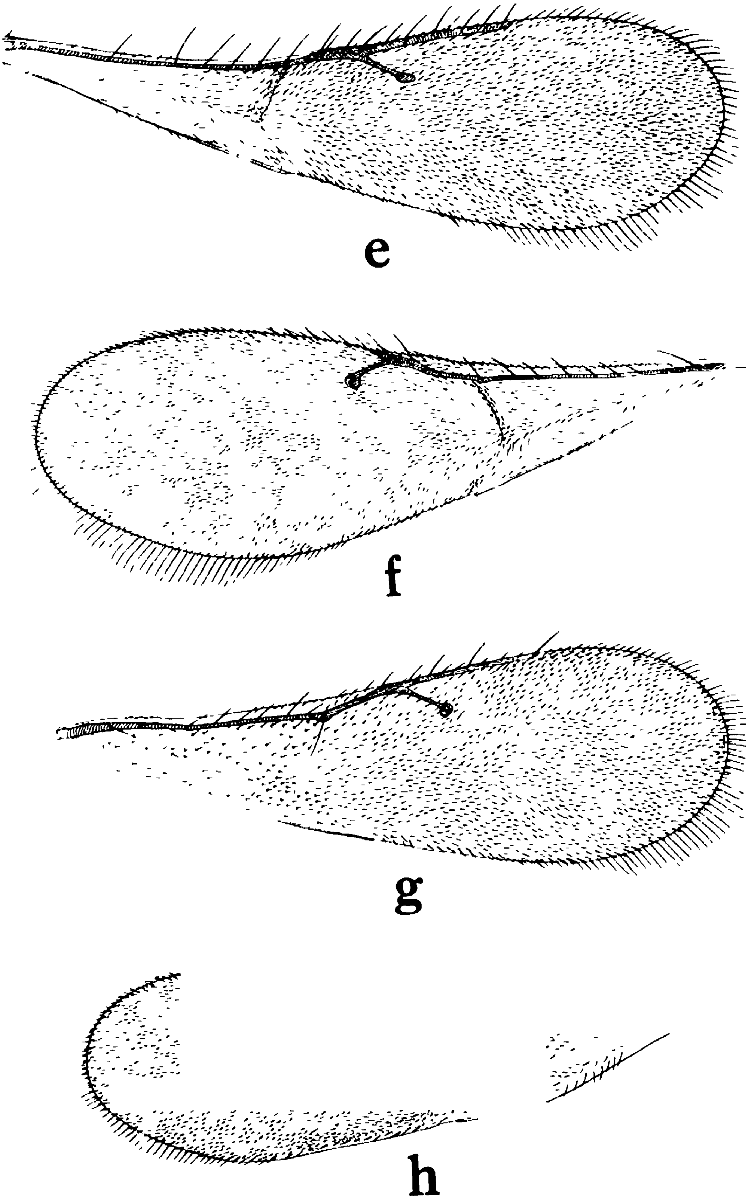


d

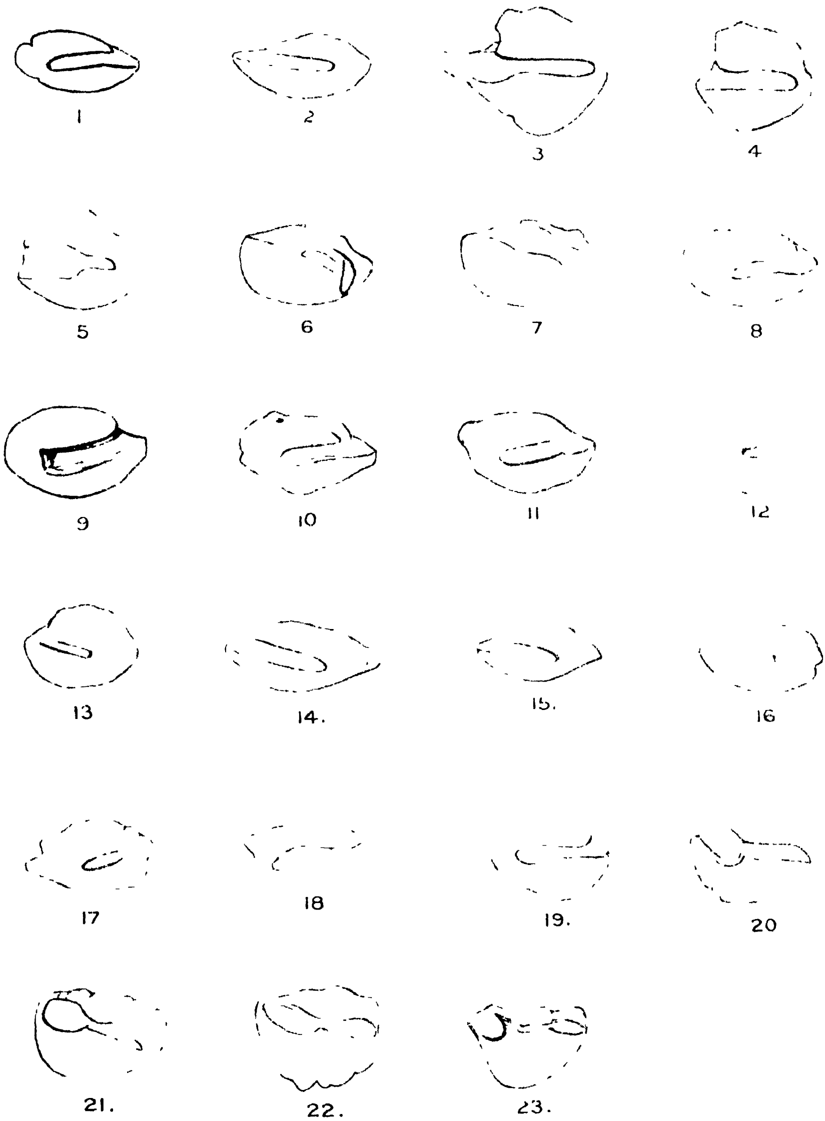
A. J Engel Terzi del

South African Scelionidæ.



A. J. Engel Terzi del.

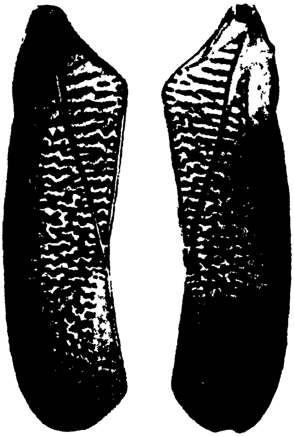
South African Scelionidæ.

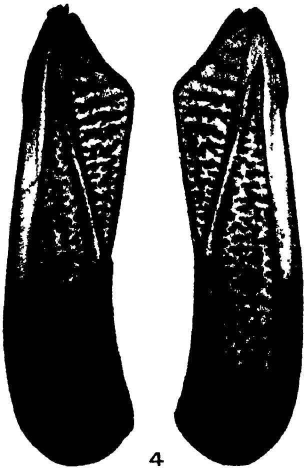


G. Allan Frost del.

FOSSIL OTOLITHS OF THE ORDERS ISOSPONDYLI APODES, BERYCOMORPHI

LUNDBLAD *Ann. & Mag. Nat Hist. S. 10. Vol. XII. Pl. XIII.*





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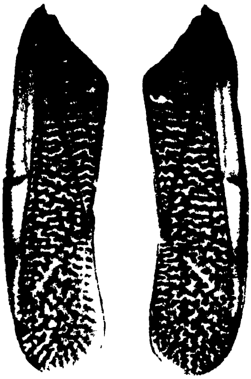

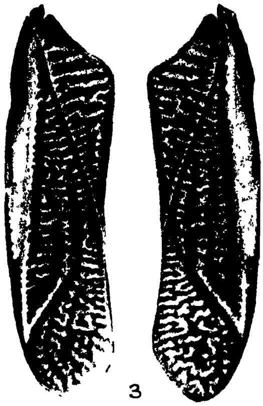

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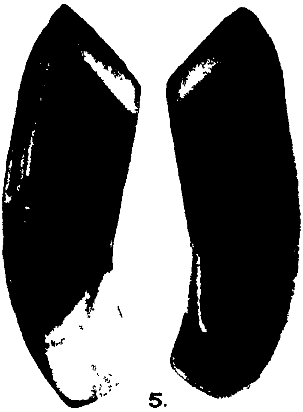

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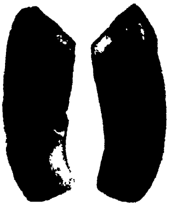

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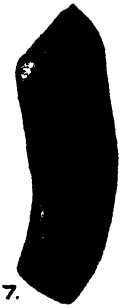

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Auct photo

CHINESE RHYNCHOTA.

FIG. 1.

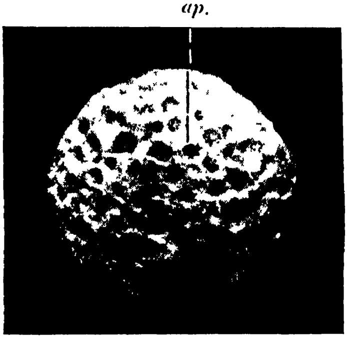
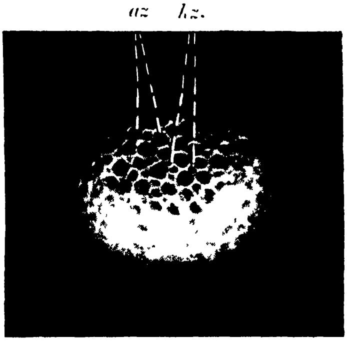


FIG. 2.



A supposed Species of Heteropora.

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